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POPULAR MECHANICS MAGAZINE

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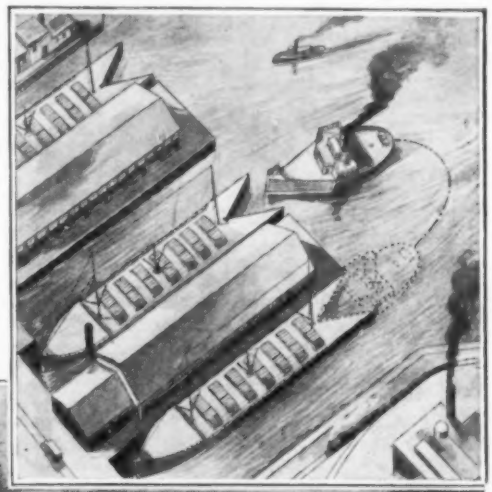
Vol. 33 MARCH, 1920 No. 3

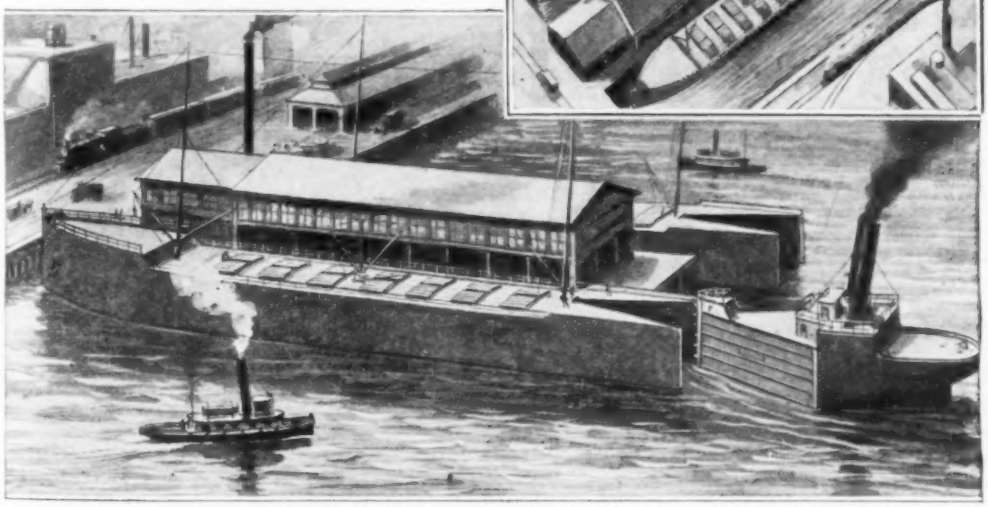
Detachable Stern Serves as Power Plant for Several Freighters

TWO-PART freight vessels, comprising interchangeable hulls and sterns, the latter equipped with boilers, engines, and propellers, and the former provided with cargo holds, in addition to coal bunkers or oil tanks, depending upon the fuel requirements of the craft, have been suggested by a French maritime expert as a means of lowering the cost of transporting goods by water.

According to the originator of the novel boats, this form of construction makes it possible to employ a single power plant with three bottoms—two in different ports, loading and unloading, and a third in transit—besides rendering it unnecessary for the driving mechanism to remain idle while fuel is placed aboard. When oil is burned, the fluid is transferred to the stern portion by means of a siphon. In case coal is utilized as fuel, the material is moved from one unit to another through a chute.

The after portion of the proposed ship is in the form of a wedge, and is designed to fit snugly in a similarly shaped opening in the rear end of the hull. A series of T-head bolts, which protrude from the vertical forward edge of the power unit, and engage with a slot in the cargo unit, are used to fasten the two parts of the vessel rigidly together. Only a few minutes are required to assemble or disassemble the stern and hull; and this, says the inventor of the craft, can be done with safety even in mid-sea.





The Upper Picture Shows Clearly How the Detachable Stern of the Two-Part Freight Vessel is Shifted from One Hull to Another, While the Lower View Shows the Power Plant Steaming into the Wedge-Shaped Opening

WIRELESS MUSIC SENDS JOY IN ALL DIRECTIONS

A phonographic concert was played in Chicago the other day for the pleasure of convalescent soldiers at Fort Sheridan,

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Phonograph and Wireless-Telephone Set That Transmitted a Musical Program Hundreds of Miles in All Directions

30 miles away to the north. Without special preparation, a large audience at Rockford, Ill., 80 miles west, managed to enjoy the same entertainment, while more than 100 long-distance eavesdroppers at Detroit, on the east, heard the widely distributed harmony through some 230 miles of space. The success of the transmission over such an unpremeditatedly wide radius marked another step in the delicate art of sending music by wireless. The apparatus used at the government station has a radius of 400 miles, and was designed by officers at the station. As a damped wave of 700-meter length was used, it is probable that many amateur stations also received the music.

GEOLOGISTS AIDED ARMIES IN WORLD WAR

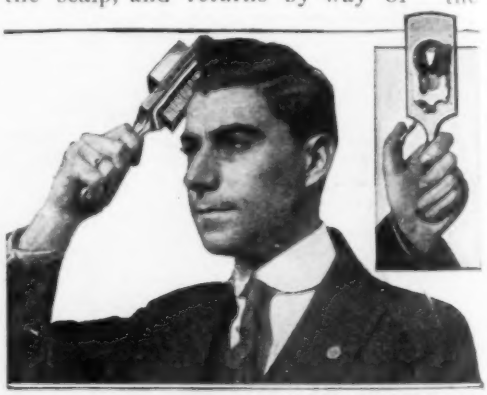
The geologists' little-known contribution to the allied victory over Germany was the theme of a recent address by a colonel who was formerly in charge of the geologists attached to the American Expeditionary Force. He revealed that the scientists were of particular value in supervising the more extensive underground operations. Furnished with reports from these experts, on stratification, extent of subterranean water, etc., the military miners were able to push their galleries with a success that often baffled the Hun. An incidental service was the location of sources of water supply.

CHICAGO'S FOREST PLAYGROUND HAS UTILITARIAN SIDE

That Chicago's belt of beauty, the forest preserve which incloses the city in a 15,000-acre natural park, has utilitarian as well as æsthetic value, is revealed by recent reports. The sale of wood and hay, hides and wool, and discarded fence wire, together with the rental of lands, brought in $13,814 in 1919, and county institutions were provided with food in the shape of 291 sheep and lambs. The herd of sheep now in the preserve numbers 375, and it is proposed that a herd of goats be added, for the especial purpose of furnishing milk to babies and tubercular patients.

MINIATURE DYNAMO MOUNTED ON BACK OF HAIRBRUSH

It is now possible to brush one's hair with a dynamo. Mounted on the back of a steel-bristled hairbrush, the little machine is activated by a reciprocating motion of the thumb. The muscular energy so expended is transformed into electricity, which flows down the bristles into the scalp, and returns by way of the



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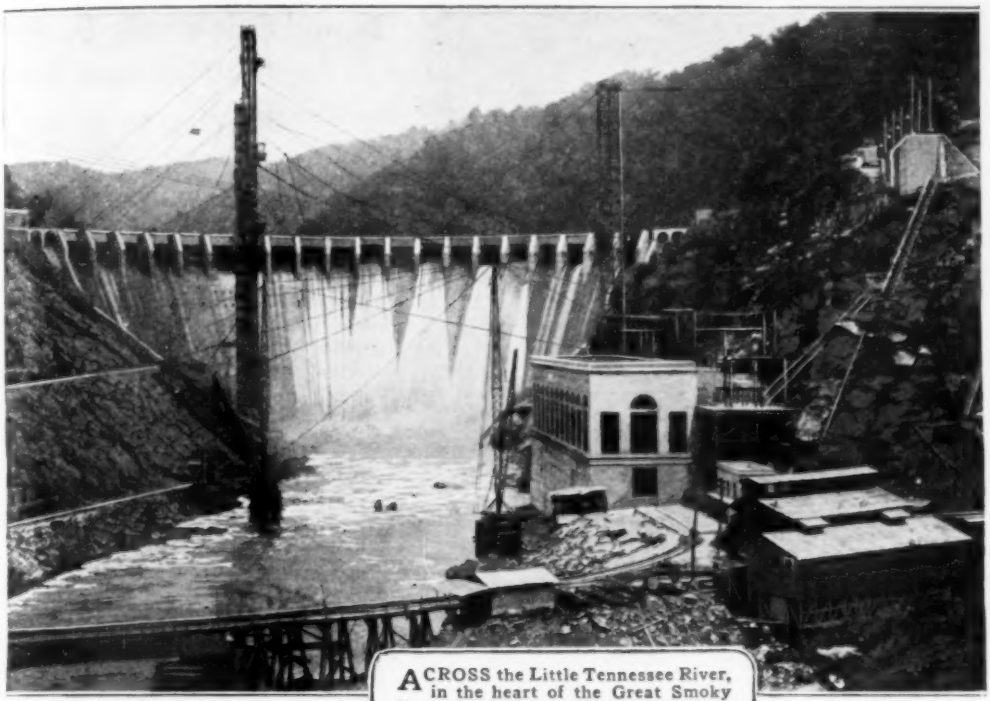
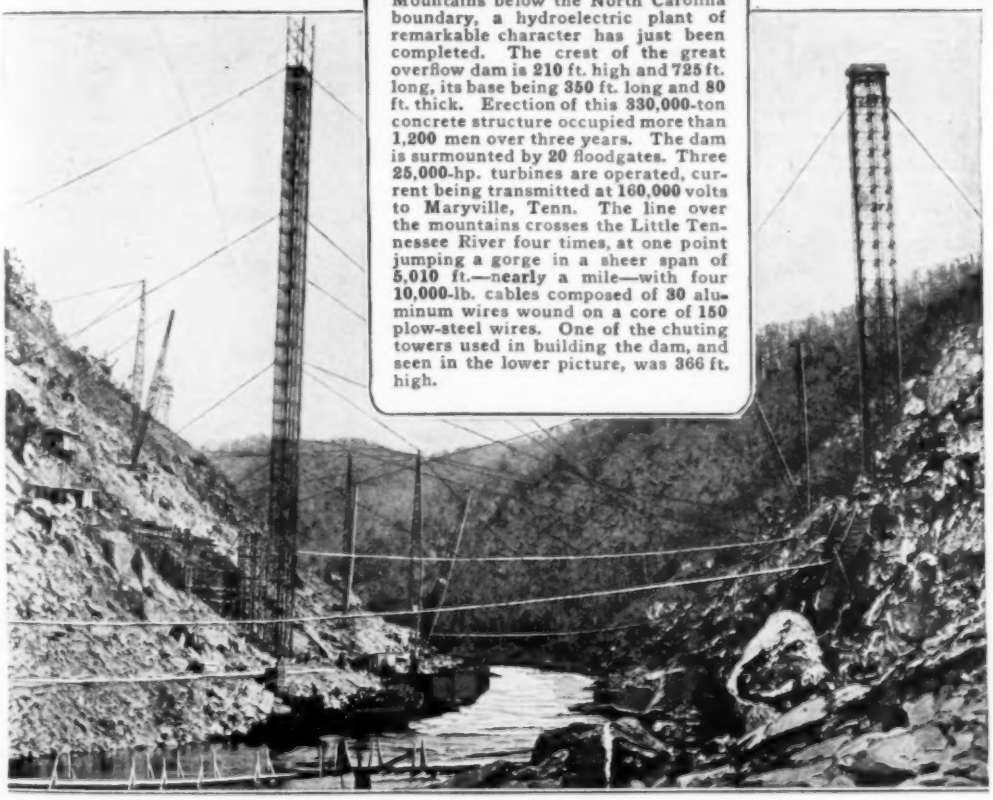
Mounted on the Back of the Hairbrush Is a Little Dynamo, Seen at the Right with Case Removed. Motion of the Thumb Spins the Armature

arm. The tingling sensation produced is of supposed tonic value to the hair follicles. A facial-massage attachment may be bought with the brush.

TENNESSEE'S HIGHEST DAM OVERTOPS NIAGARA



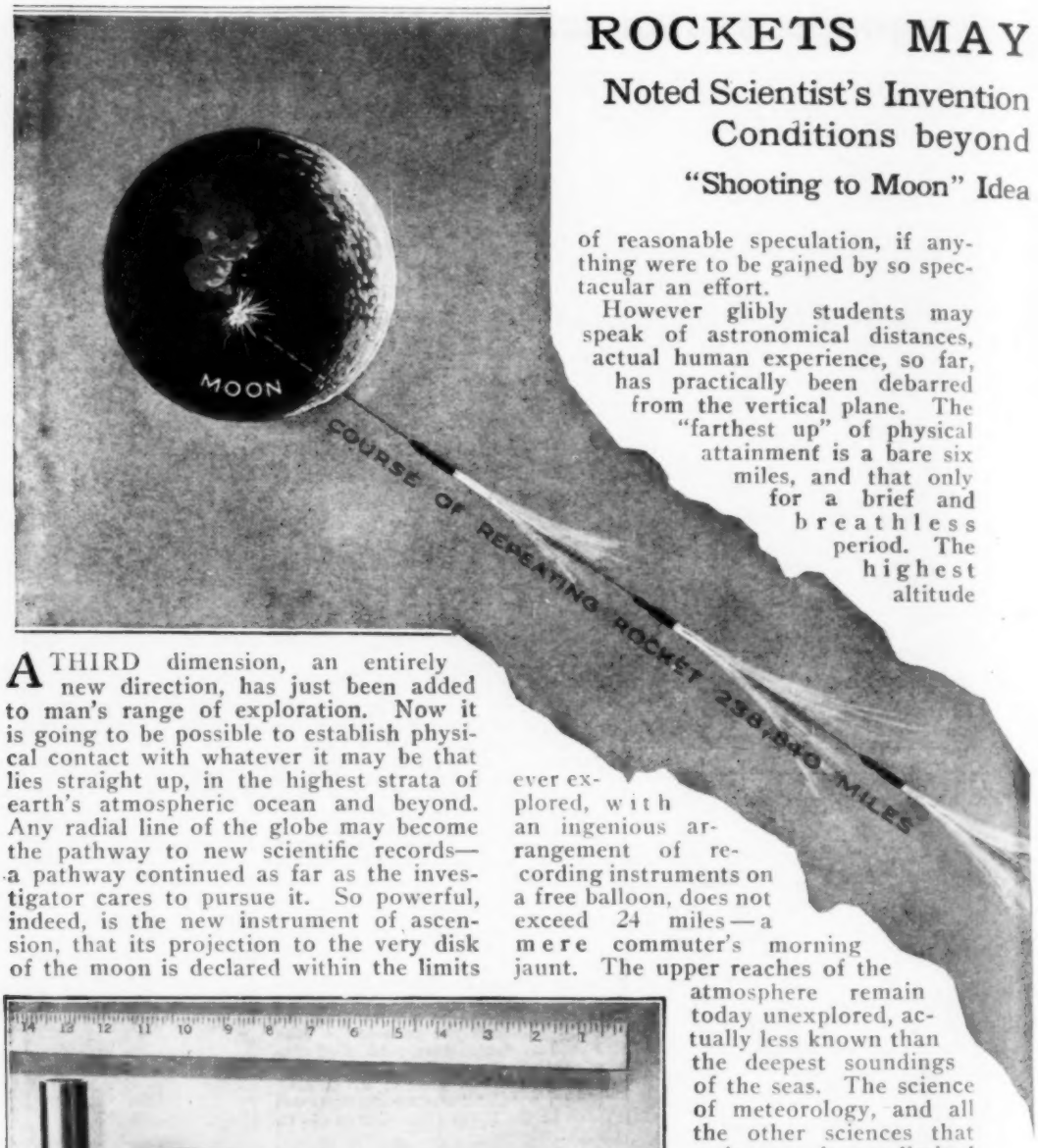
ACROSS the Little Tennessee River, in the heart of the Great Smoky Mountains below the North Carolina boundary, a hydroelectric plant of remarkable character has just been completed. The crest of the great overflow dam is 210 ft. high and 725 ft. long, its base being 350 ft. long and 80 ft. thick. Erection of this 330,000-ton concrete structure occupied more than 1,200 men over three years. The dam is surmounted by 20 floodgates. Three 25,000-hp. turbines are operated, current being transmitted at 160,000 volts to Maryville, Tenn. The line over the mountains crosses the Little Tennessee River four times, at one point jumping a gorge in a sheer span of 5,010 ft.—nearly a mile—with four 10,000-lb. cables composed of 30 aluminum wires wound on a core of 150 plow-steel wires. One of the chuting towers used in building the dam, and seen in the lower picture, was 366 ft. high.



ROCKETS MAY

Noted Scientist's Invention Conditions beyond

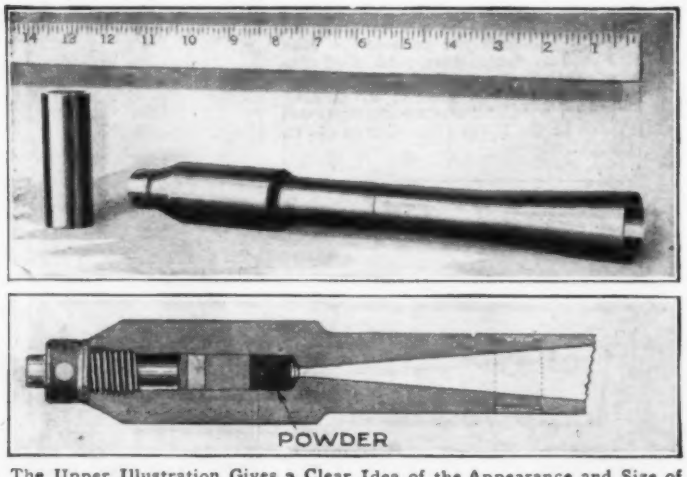
"Shooting to Moon" Idea



A THIRD dimension, an entirely new direction, has just been added to man's range of exploration. Now it is going to be possible to establish physical contact with whatever it may be that lies straight up, in the highest strata of earth's atmospheric ocean and beyond. Any radial line of the globe may become the pathway to new scientific records—a pathway continued as far as the investigator cares to pursue it. So powerful, indeed, is the new instrument of ascension, that its projection to the very disk of the moon is declared within the limits of reasonable speculation, if anything were to be gained by so spectacular an effort.

However glibly students may speak of astronomical distances, actual human experience, so far, has practically been debarred from the vertical plane. The "farthest up" of physical attainment is a bare six miles, and that only for a brief and breathless period. The highest altitude ever explored, with an ingenious arrangement of recording instruments on a free balloon, does not exceed 24 miles—a mere commuter's morning jaunt. The upper reaches of the atmosphere remain today unexplored, actually less known than the deepest soundings of the seas. The science of meteorology, and all the other sciences that wait upon it, are limited to a mere film upon the earth's surface.

Whether or not the time will ever come when man can travel as far straight up as he may go horizontally in a day's journey, is a question that has now become immaterial. All of the facts a traveler in that strange direction could gather have become suddenly available. The instruments for recording



The Upper Illustration Gives a Clear Idea of the Appearance and Size of the Miniature Steel Rocket Adopted for the Tests. The Lower Sectional View Indicates the Interior Shape of Chamber and Nozzle, and How the Powder Charge of .3 Ounce is Placed

EXPLORE ETHER

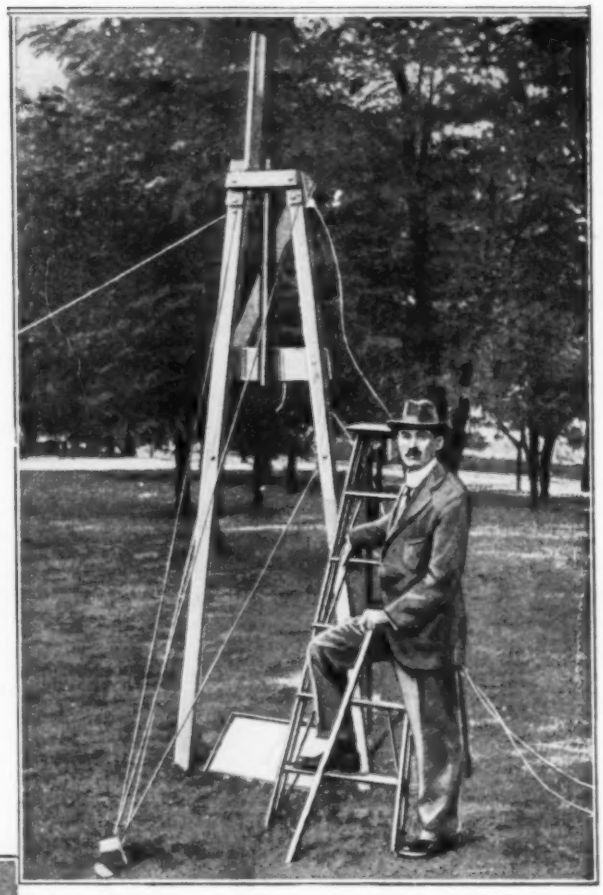
Intended to Investigate Earth's Atmosphere

Altogether Speculative

these facts may be sent up to the very point where air dissolves in space. They may go even farther than that, farther than the influence of gravitation extends, if there were any way of getting them back.

The instrument by which this wonder is to be accomplished is nothing more mysterious than a rocket; a rocket scientifically designed, of course, extraordinarily efficient mechanically, but still intimately related to the familiar paper cartridge that swishes its cometlike tail of sparks through the night air of Independence Day. Upon this simple mechanism, Prof. Robert H. Goddard, of Clark College, Worcester, Mass., has turned the engineering care that might be devoted to the design of a steam turbine.

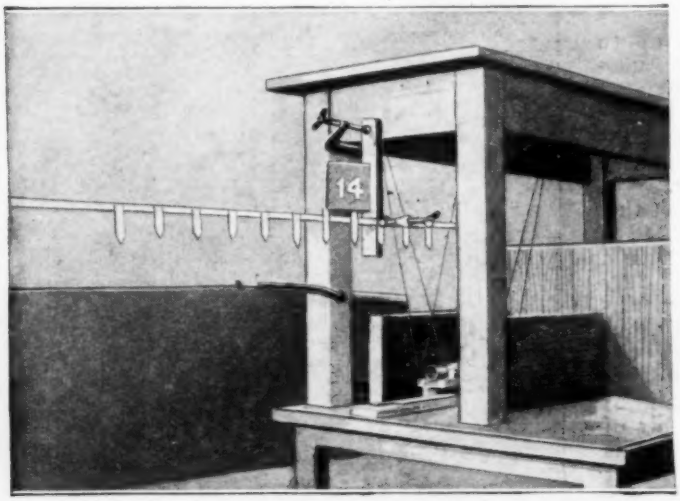
Working under the auspices



The Inventor and His Rocket-Testing Equipment: The Rocket is Set in the Lower End of the Weighted Iron Pipe at the Top of the Stand, and the Recoil Lifts the Pipe

A Purely Speculative Application of the New Rocket: The Suggestion Is to Load It with Brilliant Flash Powder and Direct It toward the Dark Side of the Moon, Watching for the Flash through Telescopes

of the Smithsonian Institution, and conducting his experiments at Mount Wilson Observatory, in California, he has fitted a steel combustion chamber with a mathematically computed form of discharge nozzle that has produced extraordinary results. When the powder charge is ignited, the discharge gases issue from this special nozzle at the tremendous velocity of nearly 8,000 ft. a second, the highest speed ever attained by any tangible thing. With this performance goes a record, regarding the rocket as a heat engine, of 64-per-cent efficiency, a figure yet to be attained by any power engine. The ordinary ship rocket, used for signaling, discharges its gases at only 1,000 ft. a second, and its efficiency is not over two per cent.



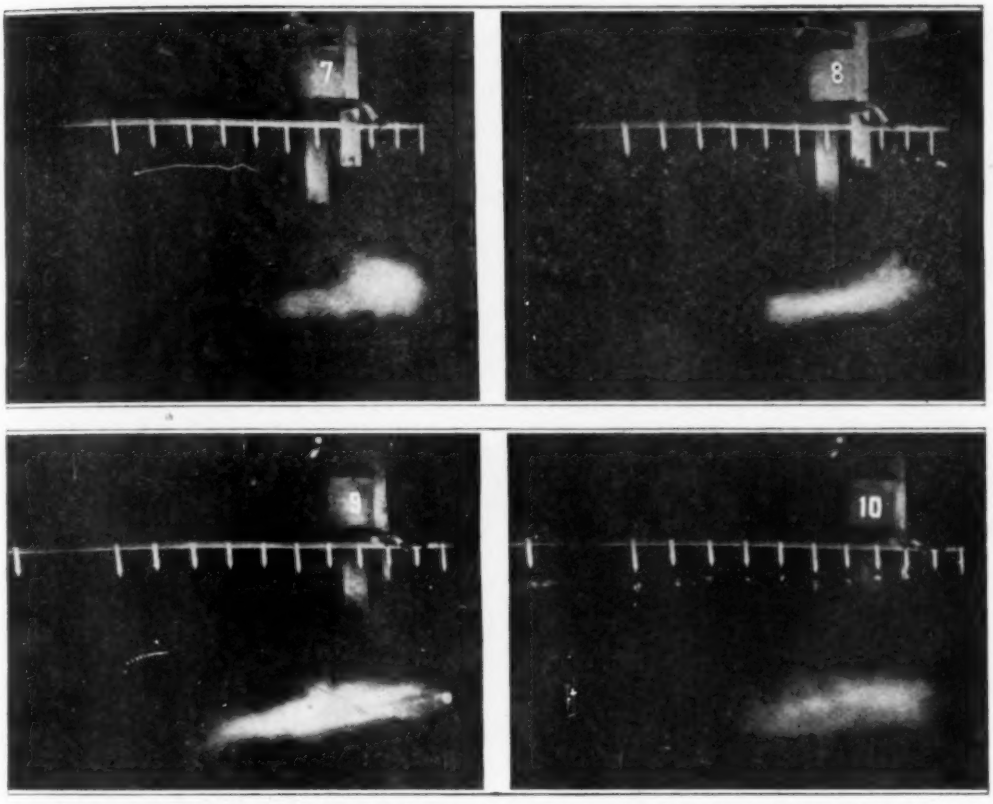
Equipment for Photographing the Discharge of Gases from the Rocket: The Card Indicates the Serial Number of the Test

To design so remarkable a machine is in itself a noteworthy accomplishment. But the really startling feature of the new rocket is still more ingenious. The perfected instrument will be a repeating rocket. It will contain a series of powder charges that will explode in relay, each ignited in turn just as the preceding charge is exhausted. Then the height which the whole machine can reach is found by simply adding the altitudes to which each charge will carry it from the point of the explosion. There is no guesswork about this computation. Figuring a fixed weight of one pound for the recording instruments carried, it is calculated that an initial weight of only 3.6 lb., including rocket shell and charges, will lift the whole equipment to a height of practically 35 miles; 5.1 lb. would carry it up over 70 miles; 6.4 lb., 115 miles; 9.8 lb., over 230 miles; and 12.3 lb., nearly 438 miles.

While these distances may not seem extraordinary as compared with the surface and mass of the earth, it must be remembered that the atmosphere itself ceases to exist some 200 miles up. Of course the ocean of air has no definite surface; it merely becomes more and more attenuated until it disappears altogether in the mystery of space. It is apparent that one of the new rockets, weighing less than ten pounds with its recording equipment, will be able to explore the atmosphere to its extreme limits, while a 12-lb. rocket will go far beyond, out into the ether. The 230-mile altitude is reached in less than 6½ minutes, a speed of over 35 miles a minute.

There appears no scientific reason why any definite limit should be set on the possible range of such a mechanism. So far as figures go, it is already computed that a repeating rocket with an initial weight of 1,274 lb. would actually pass beyond the influence of earth's gravitation, whence it would journey on by its own momentum until it came within the influence of some other body. Aimed at the dark side of the moon, and provided with a heavy charge of flash powder whose explosion could be observed through powerful telescopes, it might even serve to establish earth's first contact with its satellite. The only real value in that speculative suggestion, of course, is in emphasizing the enormous power of the relay rocket.

The practical and very great value of the machine lies in its ability to bring back, from the upper atmosphere, all the information that science may desire of that region. Accurate measurements of temperature, electrical conditions, relative density and chemical constituency at all levels, will readily be obtained. Even photographic records may easily be made, and the whole apparatus, accurately aimed, will return within a reasonable distance of the point of its departure. That quality in itself gives it



Four Consecutive Photographic Tests: The Burning Gases Discharging from the Rocket Nozzle at the Right are Photographed against a Plain Background, and the Distance of Each Flash from the Nozzle, Gauged by the Pointers Above, Is an Index of the Velocity at Which the Gases Issue

great advantage over the free-balloon system of observation now used. Control of the speed of descent calls for only a simple arrangement of tiny parachutes, adding practically nothing to the weight carried.

The tests of the mechanism so far developed are interesting. Trials of various forms of chamber and nozzle were made, not only in air but in vacuum, equivalent, presumably, to that of interstellar space. The experiments were conducted with a chamber of nickel steel having a tensile strength of 115,000 lb. The long, trumpet-shaped nozzle was made separately and screwed in place, the whole test instrument being less than a foot in length. Charged with powder, the little rocket in this form was fixed by setscrews in the lower end of a vertical 2-in. pipe, 3½ ft. long, weighted above the rocket with a length of steel bar.

As, in the explosion, the powder gases discharged at the bottom, the recoil was allowed to lift the mass of metal, recording its movement by tracing a pencil point on a chart. Further tests were made by photographing the discharge as it crossed a graduated background. With the figures established by this means as a guide, the repeating mechanism for firing successive charges in relay is now being developed and tested. As regards the charges themselves, they will have to be calculated and graded carefully, since each consecutive one will have a lighter load to propel than the preceding one, as the weight of powder dissipates in gas.

As already seen in the hypothetical bombardment of the moon, the new apparatus lends itself to speculation. The inventor himself has mentioned, merely as a distant possibility, its use for taking photographs in space, employing light-sensitive cells to actuate the shutter. But there is little need to invent future uses for the equipment, for its power to familiarize science with atmospheric conditions, not only in the remote altitudes but at all levels, high and low, is sufficiently important to place meteorology upon an entirely new footing.

Progressive Views Showing the Circulation of the Blood, Taken by Means of a Motion-Picture Camera Fitted with a Powerful Microscope: Even in This Short Series, Which Represents Less Than a Second of Time, the Variation of Flow in the Veins Is Quite Apparent

PICTURE FILM REVEALS BLOOD MOVEMENT

By fitting a powerful microscope to a motion-picture camera, a Michigan physician has succeeded in throwing on the screen detailed pictures of the circulation of the blood. The complete film presents a view of a chicken's heart in action, demonstrates the reaction between nerves and heart, depicts the causes and results of obstructed flow, and makes clear the operation of the electrocardiograph in studying the heart. Conditions of poor circulation are revealed, affording means for determining proper treatment. The films are to be used as the basis of public lectures on health subjects.

¶Italy's first fishing school has just opened at Naples with an attendance of 80 boys from the villages along the coast. Trips to the fishing grounds are made in a motorboat presented by an American society.

SHOOTING DOWN A BROKEN SMOKESTACK

During a severe windstorm some time ago, the top section, 10 ft. in length, of an 80-ft. iron smokestack buckled and toppled over, at a steel mill near Chicago. Only a small sector of the broken section held it to the stack.

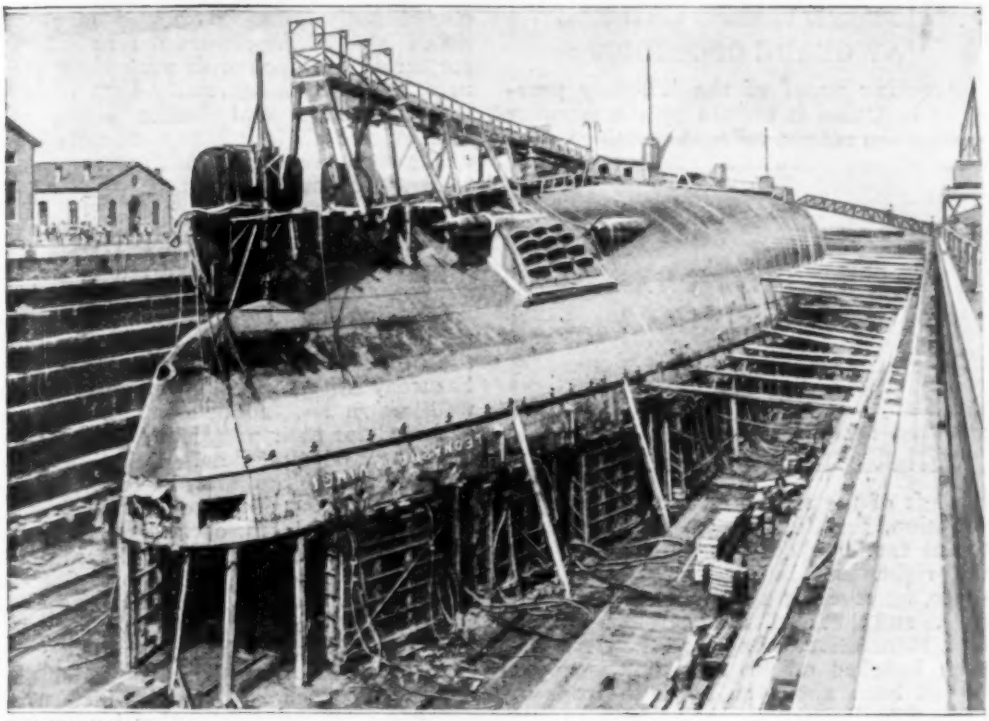
The workmen in the plant immediately became fearful that the high wind would loosen the section and blow it down upon the roof of the mill, possibly breaking the roof, which was lightly built of corrugated-iron sheeting. They refused to work until the section of the smokestack had been taken down.

As it was a very busy season, "knocking off" work while a scaffolding was erected to protect the roof, was out of the question. So the manager, recalling that one of the employes was an expert marksman, decided upon the bold plan of shooting down the troublesome section. He explained the situation to the man, and sent him home in an automobile for his rifle. The marksman returned, and, in a few minutes and in ten shots from the ground, neatly spaced ten holes in the unbroken bit of iron that still held the wrecked top of the stack. In a few minutes it broke off, fell to the roof, and rolled harmlessly to the ground.

The employes were told to vacate the building while this was going on, and the mill did not lose over 15 minutes' production.

ELECTRIC SENTINEL DETECTS HEAT FROM ENEMY'S BODY

During the next war American soldiers will listen for the enemy's night patrols in no man's land, if reports are correct, by means of sensitive instruments which will detect the heat from human bodies 200 yd. away. In the present experimental apparatus the thermal rays impinge against a thermoelectric cell, or couple, located at the focus of a parabolic, silvered mirror, 14 in. wide. Consequent change in the current from the cell affects a galvanometer and warns the watcher. The enemy will find it impossible to hide himself from this mechanical watchdog, as his body will always be at a higher temperature than the surrounding air. Lying in a shell hole he will be safe; on raising his head above the surface, however, he will be detected if within 130 yd. An instrument of this type has detected an airplane 3,500 ft. overhead.



BY COURTESY OF L'ILLUSTRATION

WRECKED ITALIAN CRUISER PLACED IN DRY DOCK FOR REPAIRS

RESTING upside down in a dry dock at Taranto, southern Italy, the cruiser "Leonardo da Vinci," which was sunk late in the summer of 1916 near that seaport, is being re-covered, and soon will be floated in its normal position, thoroughly repaired, and eventually restored to the Italian navy. The vessel went down in 40 ft. of water, following an explosion, and turned completely over as it sank. When the wreck was salvaged, sections of the hull were sealed, and the water in them removed with pumps. Rendered buoyant by this means, the ship rose to the surface. Eight cylindrical pontoons were attached as stabilizers to the resurrected war craft, which was then towed to port, keel uppermost, and placed in the dock. The cruiser is 550 ft. long, and has a displacement of 26,400 tons. Two hundred and forty-two lives were lost in the disaster.

EUROPEAN BARBER MAKES OWN ELECTRIC HAIR CLIPPER

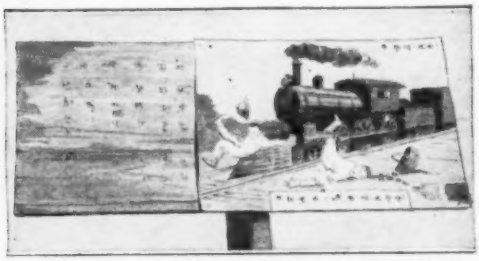
The motor-driven hair clipper, popular in up-to-the-minute barber shops on this side of the Atlantic, has now found its way into one, at least, of Europe's quaintly medieval establishments. In this case the apparatus was put together by the barber himself. The little motor, attached to the back of the clipper, takes power directly from the shaft. Current is drawn from two formidable dry cells which are ranged ostentatiously on the shelf before the customer.

Being Something of a Mechanic, This European Barber has Made His Own Electric Hair Clipper. Current is Supplied by the Cells on the Shelf

¶Hauling a rubber-tired vehicle on a good pavement, and a steel-wheeled vehicle on a track, require practically the same power, on the authority of an English scientist, who questions the street car's right to continued existence because of the inflexibility of its course.

PICTURE WARNS CHINESE AT GRADE CROSSINGS

Amusing proof of the illiteracy prevalent in China is offered by the warning signs often seen at railroad crossings. On



This Graphic Warning is Displayed at Many Chinese Grade Crossings. The Inscription at the Left Is for the Benefit of the Occasional Scholar

the left of the signboard is a Chinese inscription, for the learned, corresponding to the familiar "Stop, Look, Listen." At the right, and occupying most of the space, however, is a flamboyant portrayal of the end that awaits the careless. Struck by a locomotive, a hapless Chinaman has been knocked off his feet, and is about to fall back upon the track in front of the oncoming train. A companion has already been injured by the encounter.

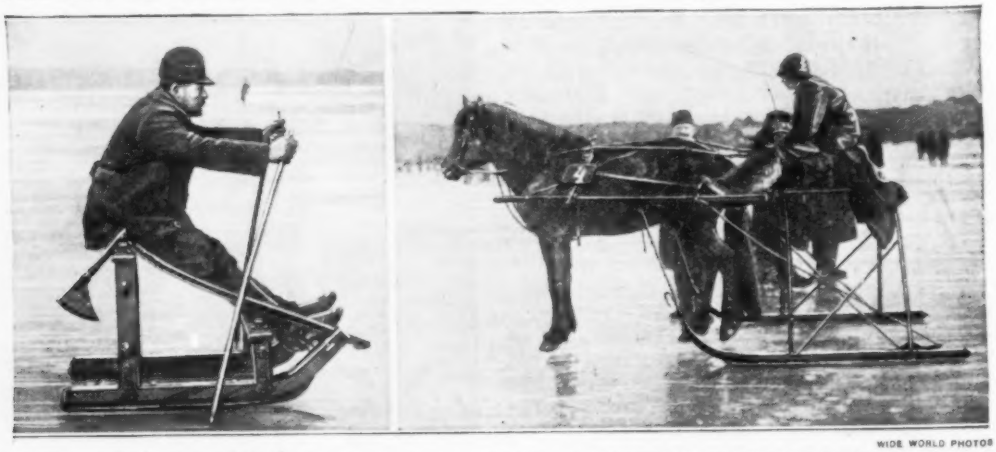
GERMAN SPORTSMEN PATRONIZE NUMEROUS SLEIGH RACES

Sleigh races were frequent and popular sporting events in Germany last winter, due to the fact that protracted cold weather provided an abundance of ice-covered courses. Some peculiar vehicles were used in the contests. These included both horse-drawn and man-propelled sleds. A common type of the former is equipped with very short runners, and has an extremely high driver's seat, located several inches above the level of the shafts. Many entrants rode on homemade sledges, which were pushed with spiked sticks.

AUTOMOBILE MEN TAKE UNIQUE CENSUS

Standing on 20 busy street corners throughout the United States, between the hours of four and six on a specified Saturday afternoon, 20 employes of a well-known automobile concern recently gathered for their president a mass of interesting and vital data. Collating their reports, a few days later, he learned that, of 37,424 automobiles observed, 23,380, or about two-thirds, carried only one or two passengers. Thus, of 2,464 cars passing Fifth Avenue and Forty-Second Street, New York, 651 carried one passenger, 626 two, 345 three, 337 four, 280 five, and 225 more than five. The Chicago enumerator, stationed on Michigan Avenue, counted 2,269 cars, which were grouped by a similar classification, as follows: 616, 594, 313, 305, 248, and 193. Similar proportions were approximated with remarkable regularity by all the other reports. It was remarked in each case, also, that more than five persons were habitually carried by only the cheapest cars.

¶Jerusalem now has its first English newspaper. The sheet is a daily called the "Jerusalem News," and is under American management.



WIDE WORLD PHOTOS

German Sleds: On the Right Is a Horse-Drawn Vehicle, Constructed Especially for Racing on the Ice. The Unusual Conveyance at the Left, Which is Propelled by Spiked Sticks, was Made from Scrap Material

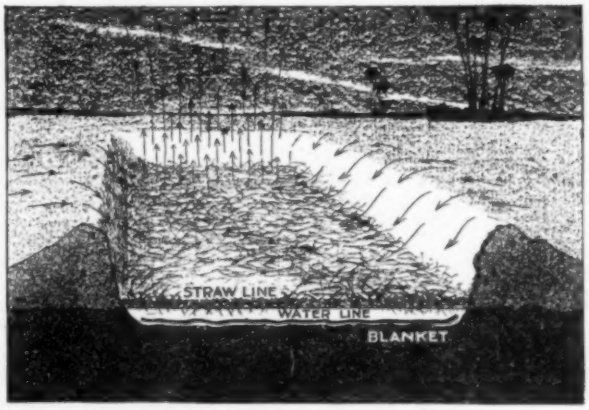
As the Fever-Stricken Man Looked Helplessly On, His Friends Busied Themselves with Spades and Buckets. Through the Hot, Loose Sand of the Surface They Dug Down to a Cooler, Denser Stratum. They Leveled the Bottom of Their Pit, Spread a Blanket to Exclude Ground Heat, Covered This with Straw and Water, and Finally Sat Anxiously around Their Extemporized Ice Plant Waiting Results

NATURE FORCED TO MAKE ICE IN SANDS OF SAHARA DESERT

By ROBERT MacMILLAN LAW

IT is seldom that fate grants to a humble refrigerating engineer the chance to save a comrade's life by the application of his technical knowledge. But the opportunity did present itself, several years ago, and was improved. A group of us, on a professional errand bent, had ridden camel-back across the Sahara Desert for many days without a mishap. But at last, 300 miles from civilization, and while traversing a tract of burning sand, one of our number was stricken down by a malignant fever. Our little caravan was halted. We knew that the sick man, to be saved, must be packed in ice.

I will admit, at this point, that our subsequent efforts would have been fruitless but for the very favorable conditions then existing in that part of the waste. Our thermometer at noon had regularly registered 130° F.; in the early morning it had as often sunk to 55° F. Most important, the air was dry, even beyond the usual dryness of the desert. Water for the camels and our personal needs we had already drawn from an oasis, half a mile away.



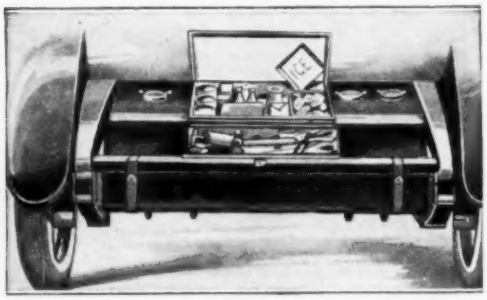
Here, in Cross Section and Purposely Exaggerated, is Seen the Construction of the Desert Ice Plant. Excessive Evaporation and Concentration of the Coldest Air Combined, about Midnight, to Freeze the Water around the Straw

At seven that evening we shoveled down through the hot sand of the surface, to a cooler, denser stratum underneath, forming a pit about 6 by 9 ft., and 18 in. deep. The waste sand we banked around the sides. On the level bottom of our depression we spread a blanket measuring about 5 by 8 ft. Drawing on our supply of camel fodder, we obtained a quantity of straw, which we chopped fine and scattered over the blanket. From the friendly oasis we drew many buckets of water, finally covering the blanket to a depth of half an inch.

As the night closed down upon us, the temperature fell, the cold air sank into our little cooling pocket, and evaporation into the parched air went on. Soon after midnight the temperature dropped abruptly, and we were delighted to see frost crystallizing about our floating straw. The water was freezing itself! Evaporation was proceeding so rapidly that the consequent cooling of the water was more than counterbalancing the combined effects of heat filtering down through the pit's cold, dense air, and ground heat struggling through the insulating blanket. At three o'clock, lantern light showed the straw imbedded in a continuous sheet of ice. Our comrade's life was safe.

NOVEL AUTOMOBILE ACCESSORY CARRIES VARIOUS SUPPLIES

Compartments for carrying extra supplies of gasoline, oil, and water are combined with a refrigerator and a tool chest in a recently patented automobile accessory. Similar in appearance to a rear-end fuel tank, the contrivance is intended to be attached to a motor car in the same manner. Heat-insulating material is packed between the double walls of the case, in the center of which are the tool chest and refrigerator. At one end there is a gasoline container, and at the other separate receptacles for holding oil and water.



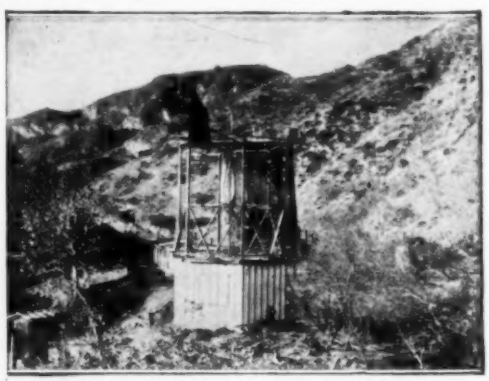
Numerous Supplies for a Motor Trip, Including Food, Gasoline, Lubricating Oil, Tools, and Water, can be Carried in This Novel Automobile Accessory

MANY DOORS AND NO STRAPS FOUND ON NEW COACHES

To facilitate unloading and loading at station platforms, the new passenger coaches in service on an electric suburban line running into London are provided with five sliding doors on each side. This is notable, therefore, as one of the first large-scale applications of a scheme that has had many advocates. In addition to avoiding rush-hour jams in this way, the designers of the new coach have done away with strap hanging, by doing away with the straps. Instead, they provide brass rails along the length of the car. One wonders if the rails came from America, where they once may have had a lowlier function.

CANVAS SAILS REPLACE VANES IN ODD GEARLESS WINDMILL

Sails like those of a boat, that can be spread or furled, take the place of the conventional vanes of wood or iron, on a windmill now operating in southern California with entire satisfaction to its owner. The shaft is vertical, and works the pump without gears. The sails on one side of the shaft are shielded by an iron guard, which is attached to the rudder and swings around to the most efficient position with every shift of the wind.



Windmill with Folding Canvas Vanes, Seen Furled in the Center: The Semicircular Shield Operated by a Rudder Permits Wind to Strike the Vanes Only at One Side of the Shaft

The Hemp-Harvesting Machine, Latest of Mechanical Aids to Agriculture, is Drawn by a Tractor. It Cuts the Stalks Close to the Ground in a Seven-Foot Swath, Passes Them over a Table to the Opposite Side, and Spreads Them Evenly on the Ground

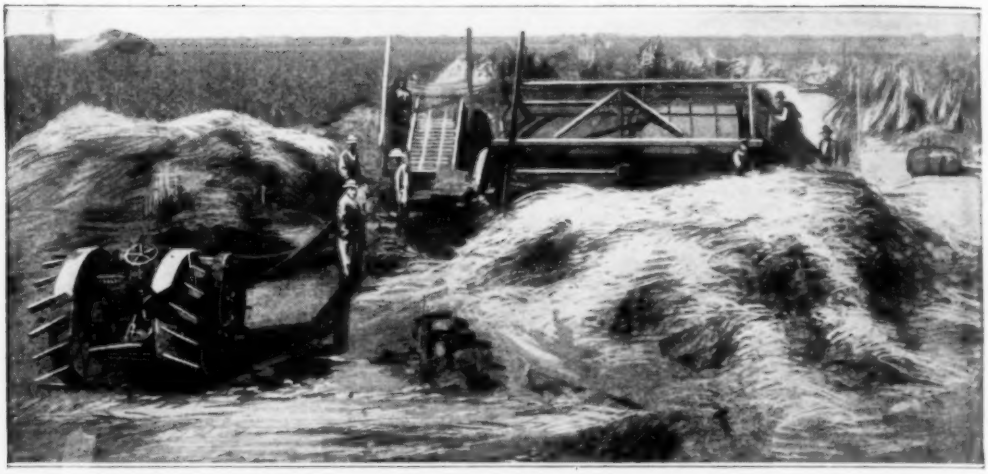
The Harvester Leaves the Cut Hemp Lying in Windrows, Where It is Allowed to Ret, by the Action of the Weather, for Several Weeks before Gathering

The Cut Hemp, as It Lies in the Field, is Gathered by the Teeth of the Rake Projecting below the Gathering and Binding Machine, Passes Upward and Back through the Conveyor, and is Tied in Bundles with Evenly Butted Stalks, Ready to be Loosely Shocked for the "Sweating" Process

HEMP-HANDLING MACHINES CREATE NEW INDUSTRY

Though hemp has been grown for its fiber for many years in this country, its cultivation on a large scale is practically a new domestic industry. The stimulation has been provided by the development of new and efficient machinery for harvesting, braking, and scutching the long stems of the useful annual. As a crop, the action of hemp on the soil is reported as especially kindly, as it returns some 60 per cent of the mineral values, its roots penetrate deeply, and it is a natural weed eradicator. The process of handling resembles that of flax, on a coarser scale. The stalks, cut cleanly and laid in windrows by the new harvester, are left for four to ten weeks for the retting effect of the weather, that the fiber may more easily be separated from the rind.

The retted stalks are fed into a braking machine containing 12 pairs of rollers for crushing the rind, the first pair having shallow corrugations, the next four coarse ribs and grooves, and the balance ribs that grow finer until the last pair is smooth. A scraper prevents wrapping around the rollers, and the feed tables at

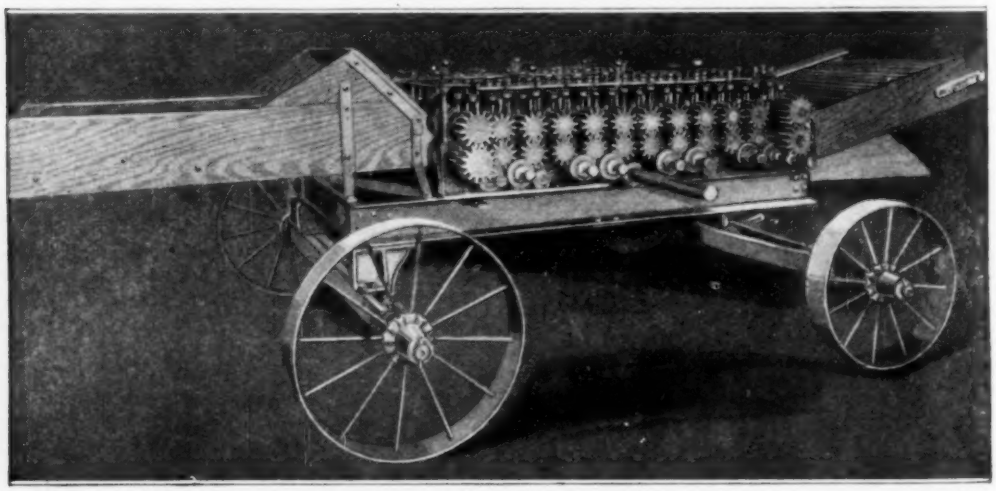


The Scutching Machine, Which Separates the Hemp Fiber from Its Rind, Has Two Cylinders Eight Feet Long, Eight Scutching Bars with 20 Reversible Combing Disks Each, and Four Beater Bars

the ends operate automatically. The final separation of the fiber is accomplished by a huge scutching machine, with two cylinders, 5 ft. 5 in. in diameter and 8 ft. long, mounted on a wood frame and truck for portability. Each of the eight scutching bars carries 20 reversible combing disks, graduated from wide to close spacing toward the rear. A two-inch shaft, with three sets of spokes on three hubs, carries the substantial beater bars. Though not yet in standard form, the new machines are already at work, some 42,000 acres are sown to hemp, and other machinery is being designed for converting the 20,000-ton crop into twine and cordage to meet the increasing demand.

AIRPLANE LINKS ICE-BOUND MURMAN COAST TO FINLAND

The airplane has broken, at last, the ice-bound isolation which each year has shackled the Murman Coast of Russia. Such, at any rate, is the hope aroused by the recent establishment of an aerial mail and passenger service between Sordavala, in southern Finland, to the Russian coast, 500 miles to the north. The inaugural trip was made several weeks ago, the plane carrying mail bags and a single passenger. In Helsingfors it is believed that the enterprise has the sanction and support of the Murman as well as the Finnish authorities.



The Roller Braking Machine Crushes the Rind of the Hemp for Easy Removal: It Has 12 Pairs of Rollers, Ranging from Coarsely Corrugated to Smooth, with a Conveyor Feed at Each End, and Scrapers to Prevent Adhesion of the Fibers to the Rolls

TAKE CENSUS BY MOTORBOAT AMONG FLORIDA KEYS

Among the unusual features of the government census just being completed is the record of one hard-working enumerator who covered his whole territory, containing thousands of square miles, in a motorboat. An entire county on the southernmost point of Florida, including the 150-mile chain of keys on the gulf side, composed the extraordinarily extensive assignment of this official collector of names, who was selected for his familiarity with the curious mazes of that semiaquatic district. He and his helper slept in their boat. Water craft were also used in taking the Everglades census, which was never before enumerated.

"HAMBURGER" FUEL AIDS IN COAL FAMINE

"Hamburger" fuel is the nickname applied to hogged, or ground-up, slab wood and mill refuse, which proved of great value to the Northwest during the recent coal shortage. Down-town business houses, stores, and other buildings which had been using coal or oil, tried it out and immediately adopted it as more economical than either coal or oil.

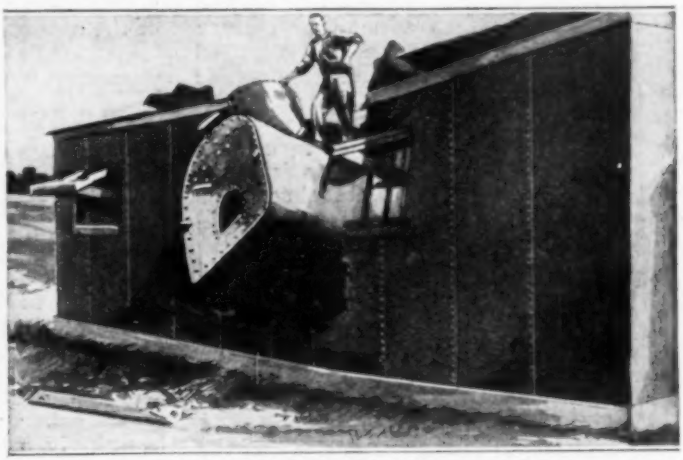
One unit of 200 cu. ft. of hamburger fuel, selling at the lumber mills for $2, will evaporate 10,000 lb. of water, according to engineers, while a barrel of fuel oil, costing $1.85, evaporates only 3,600 lb. of water. A ton of coal, costing $11, evaporates from 8,000 to 20,000 lb., depending on the quality of the coal.

"Hogs," the huge grinders of mill waste, have been in use for many years, but heretofore have only been preparing fuel for the mills themselves, the larger part of the product being conveyed outside the mills and consumed by burners to get it out of the way.

One of Seattle's largest department stores adopted hogged wood as fuel a year and a half ago and reports a saving of several hundred dollars a month over oil or coal.

EXPLODING BOILER FALLS INTO BUNKHOUSE

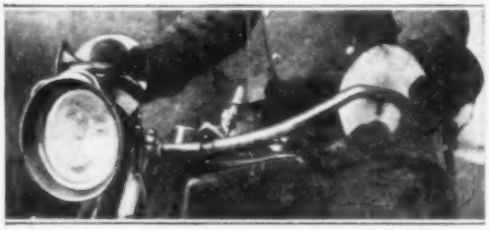
The late afternoon quiet of a camp in the Big Muddy oil field of Wyoming was shattered, some weeks ago, by a roaring explosion and subsequent crashing that brought workers, running, from the nearby wells. They found that a big boiler had torn itself from its foundations; had flown, bounded, and rolled for more than 200 ft., and finally come to rest square in the middle of a large bunkhouse. As the bunks were all empty at that hour, no one was hurt.



Torn from Its Base by Explosion, the Big Boiler Leaped and Rolled through Camp for 200 Feet, Finally Burying Itself in This Bunkhouse

LEATHER DISKS SHIELD HANDS OF MOTORCYCLE RIDER

Shields for protecting the hands of motorcycle riders in cold weather are the invention of an eastern city policeman.

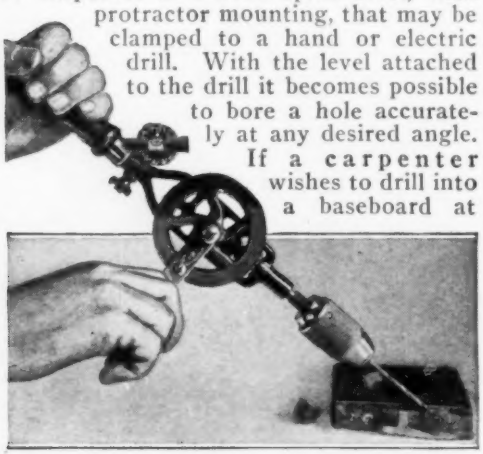


Hand Shields for Motorcyclists: These Devices, Which Are the Invention of a Policeman, are Placed on the Handlebars of the Machine in Front of the Rider's Hands

The devices are very simple, consisting of two stiff leather disks, intended to be slipped on the handlebars of a machine in front of the grips.

LEVEL AND PROTRACTOR MADE FOR USE WITH DRILL

Of decided convenience to the mechanic or carpenter is a little spirit level, with protractor mounting, that may be clamped to a hand or electric drill. With the level attached to the drill it becomes possible to bore a hole accurately at any desired angle. If a carpenter wishes to drill into a baseboard at



The Spirit Level, with Protractor Scale, is Seen Just below the Upper Hand. A Special Block Mounting is Required for Attachment to an Electric Drill

45°, he sets the level tube at that figure on the protractor scale plate. He then bores the hole, holding the brace steady, and in such position that the bubble is continuously centered.

SIGNS ON CAR CEILING FLASH NAMES OF STATIONS ON ROUTE

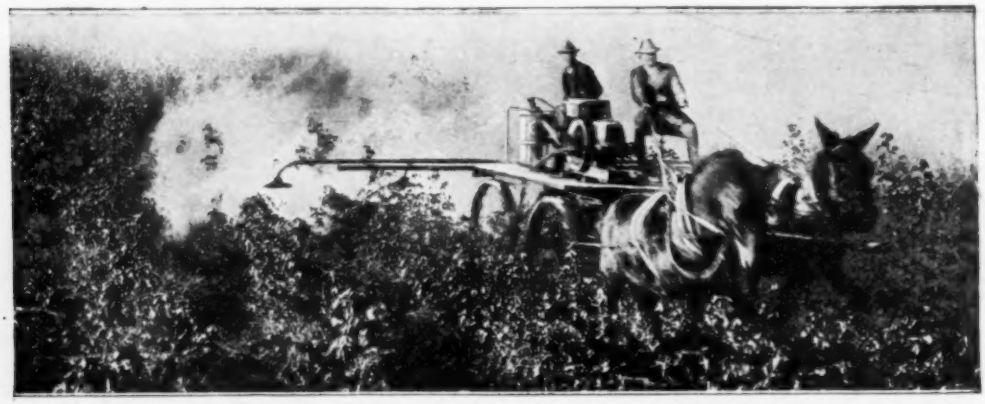
Electric station annunciators of a novel type are being installed on the passenger coaches operating over one branch of London's subway system. The names of the various stations are painted, in proper order, on glass panels set into the car ceiling. Behind the panels are electric lights, which are turned on and off in rotation as a projecting arm is tripped by strikers on the track between stations. Thus, at any given time, all the plates are dark except the one displaying the name of the next station.

EXPERIMENT WITH SPIDER WEB AS SUBSTITUTE FOR SILK

Spider webs are commonly regarded as worthless, but if experiments now in progress on the island of Madagascar result in the discovery of a method for utilizing the material in a commercial way, many articles at present made from silk are likely to be manufactured from this insect product. According to recent reports, excellent progress has been made by those in charge of the tests. The thread produced by spiders is declared to be finer in quality, stronger, and more beautifully colored than that obtained from silkworms.

ENGINE BLOWS POISON POWDER ON WEEVILY COTTON PLANTS

Killing boll weevils in an infected cotton field is usually a tedious task. But a new horse-drawn machine makes short work of it, blowing calcium-arsenate powder onto the plants at the rate of 60 to 70 acres a day. The blower fan is driven at 2,500 r.p.m. by a gasoline engine, and there are five nozzles which throw the powder on from two to five rows of plants at a time. For smaller plantations, a model is being developed with its blower driven from the wheels.



Machine for Treating Weevil-Infested Cotton Plants with Calcium-Arsenate Powder: The Apparatus is Horse-Drawn, but the Blower Itself is Driven by an Engine. Five Nozzles Blow the Poisonous Powder on Two to Five Rows of Plants at One Time, and 60 Acres or More can be Covered in a Day

Left: Locked Electric Switch Boxes Mounted on Street Poles. Right: Auto Using Current to Prevent Freezing of Radiator

TAP STREET CIRCUIT TO KEEP AUTO RADIATORS WARM

Keeping the radiator of his parked car from freezing is the least of troubles to the autoist of London, Ont. By paying a flat fee for the season, he obtains a key which unlocks the covers of electric sockets attached to terminal boxes, mounted on posts at frequent intervals along the streets of the city. A small electric heater with a long cord is carried in the car, and connected to the street box by simply inserting a plug. Not only is the car's circulatory system safeguarded, but its interior is kept comfortable during the owner's absence. The electric power used comes from Niagara Falls, more than 100 miles away.

AERIAL HOBO BEATS HIS WAY ON AIRPLANE UNDERCARRIAGE

The airplane hobo was first observed when soldiers at the Fort Bliss airdrome, in Texas, bent their heads back for a farewell glimpse of the "Round-the-Rim" bomber, whose remarkable tour was described in the February number of this magazine. Feet dangling, arms twined about the bracing wires, he was perched on an undercarriage axle of the big plane. A scout plane was ordered into the air at once. Overtaking the bomber, the pursuing pilot revealed the presence of the stowaway, and both planes landed at the first convenient field. The adventuring soldier was transferred, and returned to his station. There, he explained, in extenuation of his offense, that he had simply grown "homesick for east Texas."

When the "Round-the-Rim" Bomber Left the Airdrome at Fort Bliss, Texas, This Soldier Went Along as a Stowaway. In the Fashion He is Demonstrating Here on Another Airplane

¶A British torpedo-boat destroyer is declared to have made a speed of 45 miles an hour in a recent trial run of four hours. This figure, if verified, probably is a world record for that class of ship.

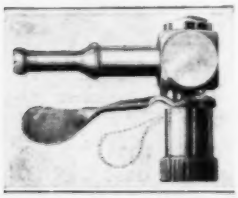
TRAVELING SCHOOLS TEACH FARMERS GRAIN STANDARDS

Back to the country schoolhouse, after absences of many years, are going farmers, millers, and grain dealers as the government attempts to popularize Federal grain standards and grading methods. In courses that vary in length from a few hours to a few days, thousands of ambitious men are learning to conduct all the tests common in the inspection office of the large markets. Government instructors acquaint them with grain weighing, moisture determination, separation of foreign material, and a dozen other standard operations. Most of the work is practical, involving actual classification and appraisal of samples provided.

The Farmers, Millers, and Grain Dealers, All Pupils at the Government's Traveling School, are Here Classifying Miscellaneous Samples

NONLEAKING AIR-HOSE CHUCK LOCKS ON VALVE STEM

Compressed air is conserved, when automobile tires are inflated, if a new nonleaking hose chuck is employed, according to the manufacturers of the device. The contrivance slips over a valve stem, and is locked in place by moving a conveniently located thumb lever. This operation causes a replaceable rubber cylinder, with which the appliance is lined, to grip the stem tightly, forming an air-tight joint.



FAR EAST WRESTS RUBBER TRADE FROM BRAZIL

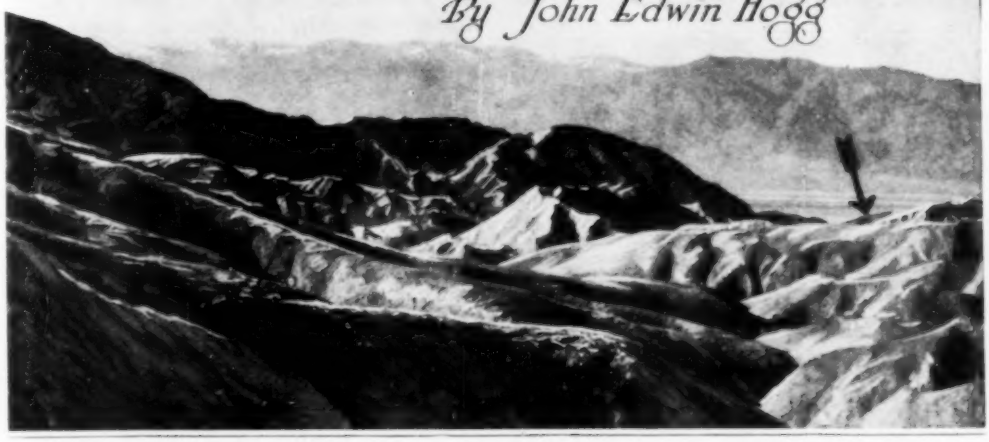
The story of Brazil's loss of the world's rubber trade, in the last decade, to the countries of the Far East, is the story of some seeds that 40 years ago were shipped from South America to England. Then, and for many years after, though production methods were unbelievably crude and working conditions in the fever-breeding jungle almost intolerable, the inexhaustible forests of the Amazon supplied the world's demand. Meanwhile the seeds in England had produced several thousand nurslings which were transplanted to Ceylon, Java, Burma, and the vicinity of Singapore. Here model plantations, owned by business men and operated by scientists, grew great. When in 1910 came the tremendous demand for rubber, the pioneering planters were rewarded for their industry. Their high-grade rubber, grown by scientific methods, gradually crowded the slipshod Brazilian product out of the market. Now it is figured that despite Brazil's still limitless supply, the Far East will supply 320,000 of the 380,000 tons of crude rubber to be produced in 1920.

NOVEL HIGH-PRESSURE BOILER HAS ROTATING WATER TUBES

The curious idea of rotating the tubes of a water-tube boiler, thereby keeping the water in contact with all sides of the hot passage, and the steam in the center, has been put into practice by a Swedish engineer with interesting results. Such a boiler, constructed for a sugar-refining plant, has 11 water tubes, each about 12 in. in diameter, with .42-in. walls, which are rotated at 375 r.p.m. With a total heating surface of 295.8 sq. ft., this boiler delivers 13,200 lb. of steam an hour at over 700-lb. pressure, with a temperature of 618° F., operating a 600-hp. turbine. Where the system is installed in existing boiler plants, the old water tubes act as preheaters for the water entering the new. It is declared wholly to overcome the usual troubles of high-pressure installations, and the inventor is constructing a boiler to generate steam at nearly 1,500-lb. pressure, which will allow a very high temperature.

FARMING IN DEATH VALLEY

By John Edwin Hogg



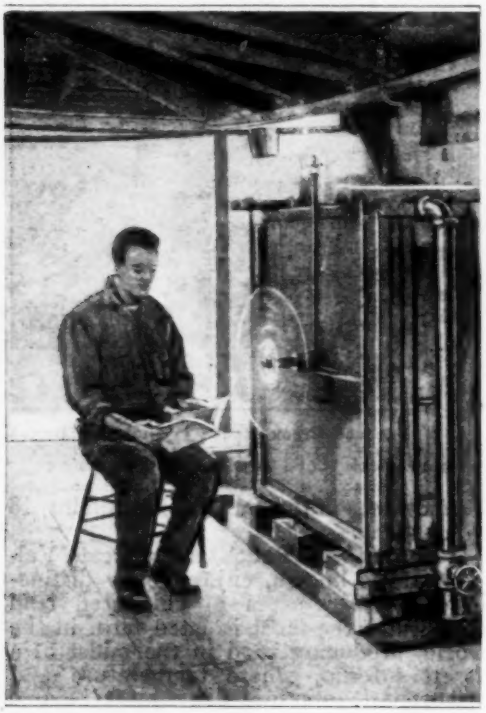
Death Valley from the Funeral Mountains: The Location of Furnace Creek Ranch is Indicated by the Arrow—It is Just under the Brow of the Hill. The Floor of the Valley, Seen in the Distance, Is 280 Feet below Sea Level, While the Snow-Clad Mountains in the Background Tower Up to 11,045 Feet

DEATH VALLEY—the most horrible desert on the face of the earth, source of weird mysteries and innumerable tragedies, where the temperature soars as high as 160°, and above whose shimmering wastes dance shifting mirages of green fields and cool streams that lead thirst-tortured souls to their doom—has yielded to the hand of man to make a garden therein. This miracle—often mistaken for a mirage—has been brought about by a commercial corporation as the only possible means of securing a source of food supply convenient to its borax mines in the Funeral Mountains, 18 miles away.

Furnace Creek Ranch, as the Death Valley farm is known, enjoys many distinctions. Its 65 acres of cultivated land constitutes the most isolated farm in the world, producing food in the midst of a desert inferno, where temperature and atmospheric pressure are almost beyond the limits of plant and animal endurance. It is situated 178 ft. below sea level on the floor of the greatest depression on the face of the western hemisphere, within pistol shot of, and only about 100 ft.

Some of the Farm Buildings at Furnace Creek Ranch: The House Is the Dwelling of the White Overseer, Who has Endured Seven Summers in Death Valley

higher than the greatest depth of Death Valley, which is the very bottom of the United States. Yet, in spite of its peculiar location, the ranch is within the shadow



The Ranch Foreman has Obtained a Degree of Relief from the Summer Heat by Building Himself a Water-power Fan. The Four One-Foot Blades Revolve at about 1,000 Revolutions per Minute, being Driven by an Overshot Wheel within the Wooden Housing

of Mt. Whitney, whose eternal snows tower into the heavens to a height of nearly three miles, the highest point of land in the continental limits of the nation.

Furthermore, Furnace Creek Ranch is probably the only farm in the world where weeds are unknown. As it is entirely artificial and surrounded by a desert barrier, the seeds of noxious weeds have had no way of getting there, and unless they be imported by man, the ranch will undoubtedly always remain free from them.

Obviously the introduction of an abundant water supply was the prime requisite to make the ranch possible. This is obtained from two large springs far back in the Funeral Mountains, which pour their streams upon the burned-out Death Valley soil through two great aqueducts, one of steel and one of masonry. Part of the water is diverted along the route to freshen a heavy growth of willows planted to give shade to the watercourse. But in spite of this, the loss of water from evaporation is very great, and in summer the water emerges from the aqueduct at temperatures up to 110°. Men and live stock, of course, cannot drink it so hot. Cooling is therefore effected by means of large evaporation "ollas," and the drinking water is quickly reduced to 70° in the hottest weather.

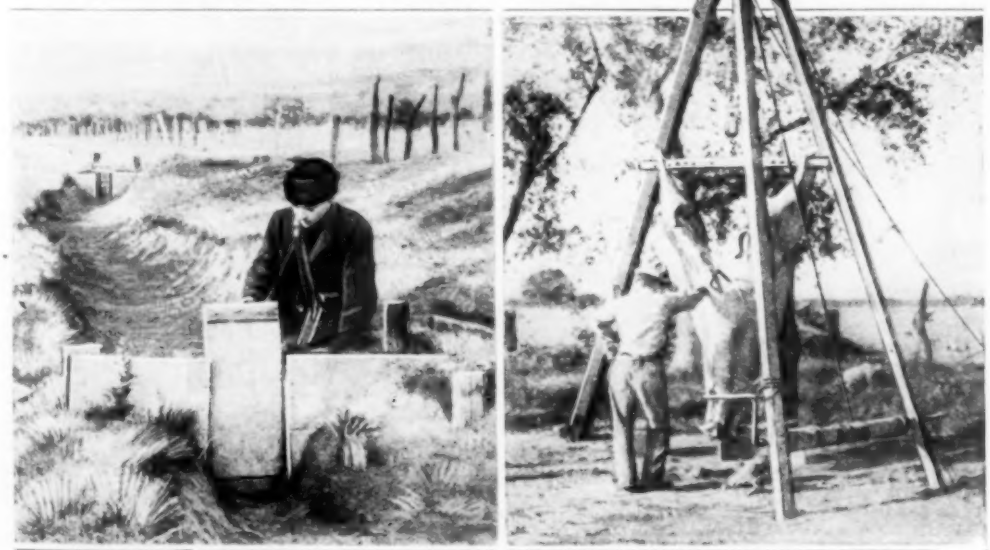
The humidity of Death Valley's atmosphere varies like that of other places, but according to analysis made by the United States Weather Bureau, its air is the driest known. Its average moisture content is less than .01 per cent. Water thus becomes as volatile as gasoline and evaporation cooling is accomplished with great rapidity. It is this speedy evaporation that has largely made Furnace Creek Ranch possible. The ranch is primarily a hay farm, the principal crop being alfalfa, which is fed to cattle and hogs. After being dressed, the meat is sent to the mining camps. The live stock could not live through the scorching summer if it were not for the cooling influence of shower baths with which their corrals are equipped. The cattle, horses, and mules are further protected from the blistering winds by having the sides of their pens covered with sheet metal. The hogs have an irrigation-ditch wallow in the shade of some cottonwood trees, and when the hot weather sweeps the valley, about all that is to be seen of

In Temperatures Up to 160 Degrees, Tilling the Soil with Animals Is Almost Out of the Question. Hence the Tractor has Made Possible the Cultivation of Death Valley Acreage

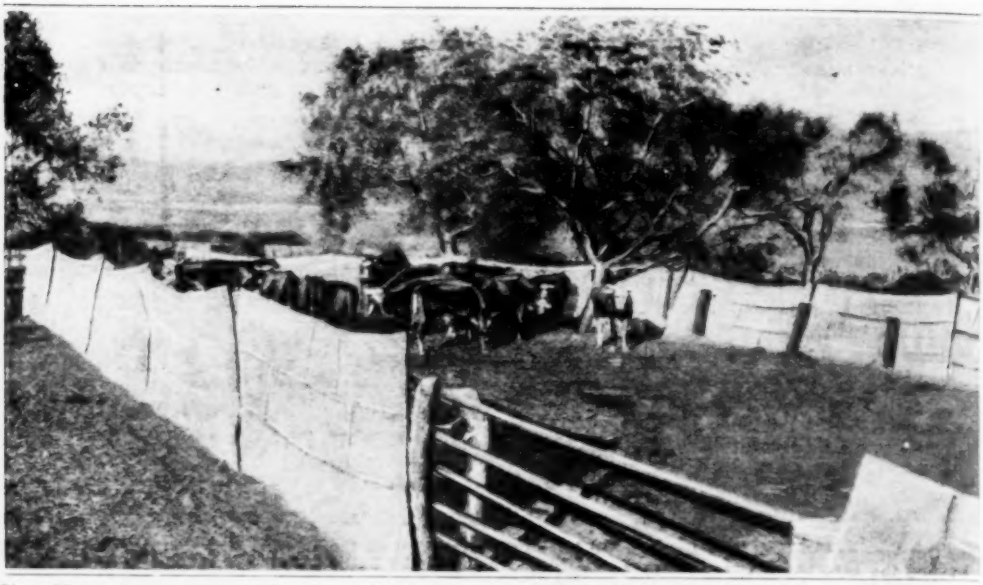
Four Cuttings per Year of Excellent-Quality Alfalfa are Harvested on the Death Valley Farm, in Addition to Letting the Live Stock Graze on the Land. The Grazing of the Cattle Eliminates Much Harvest Labor

them above the surface is their snouts. Even the hens, whose aversion to bathing is proverbial, have little hesitancy about entering the poultry yard to be "hosed off." All manner of vegetables grow well in the irrigated soil, but are not cultivated to any great extent because of the petty-thieving instincts of the Indians. Watermelons and cantaloupes attain large size and excellent quality.

White men cannot live long in the withering heat. Consequently all the work about the ranch is done by Indians of the Piute and Shoshone tribes under the direction of an educated foreman. The average life of a white man in Death Valley is very short. Three white foremen employed on the ranch lasted two summers each, and perished during the third. Two others went insane, and attempted to flee out of the valley on foot. Neither of them lived to get out of the maze of Funeral Mountain can-



Left: Due to the Rapidity of Evaporation, Lateral Trenches are Not Used for Irrigation at the Ranch. Instead the Water is Run into the Ground by Means of Deep Canals Fitted with Numerous Floodgates by Which the Water is Regulated. Right: Dressed Meat Is the Chief Product of Furnace Creek Ranch



Sheet-Metal Corrals Protect the Ranch Cattle from the Summer Winds That would Otherwise Burn Their Hides Off. The Metal Gets So Hot That One cannot Stand within Several Feet of It

ons. The present foreman has survived seven summers, and is soon entering upon his eighth. He attributes his ability to resist the heat to his superb constitution, temperate habits, and hygienic living. He has attained a degree of comfort by constructing a large fan driven by water power. During the hottest days of the summer he makes his bed in front of the fan after sprinkling the floor and wetting his blankets. For all work is then done at night, when the temperature over the valley floor descends to about 120°. The men work in the fields clad only in breechcloths and shoes.

In addition to being a sort of miracle farm, Furnace Creek Ranch is also a traveler's relief station, serving the barren blazing wastes of Death Valley and the Funeral Mountain country much the same as St. Bernard hospice does the high Alps of Switzerland. Its very existence has saved the life of many a lost traveler or prospector who staggered within its boundaries with parched throat and speechless swollen tongue. Assistance under such circumstances is never refused. If the victim of the desert has money with which to pay for his rescue, well and good; if not, he receives it gratis. On a hill just back of the ranch are a number of mounds—the graves of thirst-tortured souls who tottered into the ranch too late to be saved by water. In many instances heat-stricken men, dragged out of the salt marshes, have recovered at the ranch, to be later sent out of the valley on muleback or in wagons in charge of Indian guides who are inured to the conditions.

To Keep His Stock of Canned Goods from Blowing Up in the Summer Heat, the Ranch Foreman has Provided Himself with a Deep Dugout Storehouse

The United States Weather Bureau has established an observation station on the floor of Death Valley, near the ranch, and a part of the ranch foreman's duty is

the taking of daily observations for Washington. Reports on these are taken out of the valley once each week by an Indian runner, and go into the mail at Ryan, which is connected to the transcontinental railroad by means of a narrow-gauge line.

Some favorite demonstrations of Death Valley's heat are even more interesting than the government figures. When the writer made his first trip into the valley the temperature stood at 142° upon his arrival at Furnace Creek Ranch.

Furnace Creek Ranch Maintains Its Own Cemetery for the Interment of Thirst-Tortured Travelers and Prospectors Who Have Staggered Out of the Death Valley Heat Too Late for Its Water and Shade to Save Them

This Salt Marsh within a Pistol Shot of Furnace Creek Ranch Is the Lowest Spot on the Western Hemisphere, being 280 Feet below Sea Level

By way of avoiding another mound in the local cemetery, he was advised by the ranch foreman to get into the water, clothes and all. This suggestion was followed by rolling in an irrigation ditch, with only the removal of watch, compass, and other trinkets, from the pockets. Thirty minutes after emerging from the water every thread of clothing was as dry again as if it had never been wet. Of course, the rapid evaporation had meanwhile had the desired cooling effect. The ranch foreman later took two fresh eggs and buried them in the sand in the sun. Ten minutes later he removed the eggs, cracked the shells, and handed over the meats. They were thoroughly baked, and ready to eat. Fresh beef cut in strips and hung in the sun becomes jerked meat in a few hours. Alfalfa cut in the field becomes cured hay in an hour and a half, and vegetables, even including potatoes, shrivel up and become bulletlike if exposed to the sun's heat for a single afternoon. The hens sit on their eggs, not to incubate them, but to keep the temperature down to prevent their being cooked. The birds, of course, nest in the shade of the trees and shrubs, but even there the eggs are ruined if a hen deserts her nest for more than about two hours.

The Stygian temperature of Death Valley lasts for about five months of the year, usually from the first of May until October; the other months are cool and pleasant. Rain is virtually unknown. Consequently the irrigation of Furnace Creek Ranch is continuous.

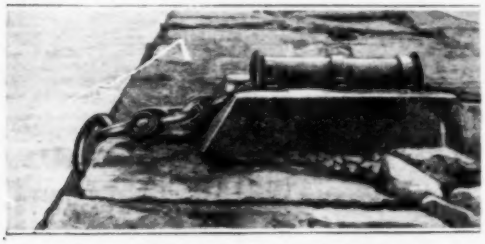
There are marvelous scenic attractions for travelers in Death Valley and the surrounding mountain country, but heretofore few tourists have looked upon its wonders because of the hazards and

The Government has Established a Weather-Observation Station on the Floor of Death Valley near the Ranch, and a Part of the Foreman's Duty Is the Taking of Daily Data for Reports to Washington

hardships of making the journey. The possibilities of the district for tourist exploitation have been recognized by the railroads and the owners of the borax mines, with the result that a definite plan is about to be launched by which this wild, picturesque region is to be thrown open to travelers. This calls for an improved passenger and guide service into the valley from one of the transcontinental main lines, and the erection of a first-class tourist hotel at Furnace Creek Ranch. With this plan in operation, and backed by an extensive advertising campaign, Death Valley with its weird and fantastic mirages, its snow-clad backgrounds, and its marvelous rainbow colorings, is destined to become one of the scenic wonders of the nation. The maintenance of Furnace Creek Ranch, and the success of its cultivation, has been largely experimental work, leading up to the bigger and broader project that is outlined for the future.

BREAKWATER MOORING DEVICES OF STRONG CONSTRUCTION

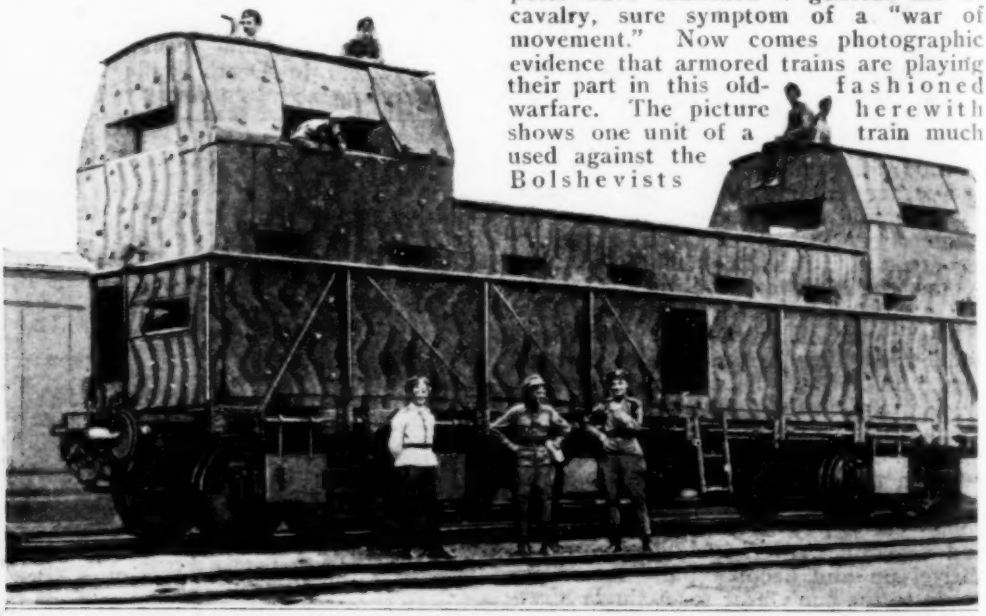
Exceedingly stable mooring devices for securing ships to a masonry breakwater, located outside a west-coast harbor, have been installed to supplant hawser posts, which were sometimes uprooted during storms. The new contrivance comprises a heavy chain, one end of which is imbedded in a block of concrete. To the opposite end is attached a large ring. The chain passes through a short section of iron pipe, also set in the concrete block, the purpose of this being to prevent the links from becoming worn by rubbing on the stone. The device is declared to be strong enough to hold the largest vessels under all conditions.



One of the Contrivances Recently Installed on a Western Coast Harbor Breakwater for Mooring Ships

ARMORED TRAINS FIGURE IN SIBERIAN WARFARE

In contrast to the siegelike operations along the western front during the World War, comes news of the guerrilla warfare now being waged in half a dozen Russian battle areas. For months reports have indicated a general use of cavalry, sure symptom of a "war of movement." Now comes photographic evidence that armored trains are playing their part in this old-fashioned warfare. The picture herewith shows one unit of a train much used against the Bolshevists



Once a Peaceful Gondola, the Camouflaged Car Above has been Transformed by Russian Counter-Revolutionists into a Traveling "Strong Point." The Turrets at Either End Hide Eight Machine Guns

on a Siberian front. Once an ordinary gondola, the car has been transformed by the heightening of the sides, machine-gun turrets rising from either end, while loopholes along the sides and ends provide for the fire of 20 rifles.

DESIGN FOR VICTORY MEDAL ACCEPTED BY GOVERNMENT

Although the nations bearing arms against Germany agreed, in the spring of 1918, to adopt a service medal that would be the same for all, they later decided to award uniform ribbons, but allow each country to design its own medal. Just a few specifications were drawn up: The medal was to be of bronze, 1.4 in. in diameter, was to bear on one side a "winged victory," and on the reverse the words "The Great War for Civilization," and the names of the allied nations. The authorized design for the American medal has now been completed. The artist has been guided

BY COURTESY OF THE NATIONAL GEOGRAPHIC MAGAZINE

This Medal will be Distributed to All American Veterans—Some 4,500,000—of the World War. The Other Nations Lately Allied against Germany will Award Medals Almost Identical

by the specification, but has made the winged victory an interesting variation of the familiar Goddess of Liberty.

GAS TANK AND PILOT CHANGE PLACES IN REMODELED DH-4'S

The American army's few DH-4B observation airplanes have proved so satisfactory that all DH-4's now on hand will eventually be reconstructed along the same lines. The biggest part of the remodeling is the transfer of gasoline tank and pilot's cockpit, putting the tank directly behind the engine. This arrangement makes communication between pilot and observer easier, and affords the pilot a measure of safety in a nose-on crash. A fire wall between tank and engine, and improved instrument board and controls are other items.

MELTING POT FOR COMPOUNDS IS ELECTRICALLY HEATED

The safety, reliability, and ease of control peculiar to electric heating are especially desirable in the work of melting

Electric Melting Pot That Solves the Problem of Heating Compounds: The Inner Flange Keeps It from Boiling Over, and Serves to Scrape the Ladle

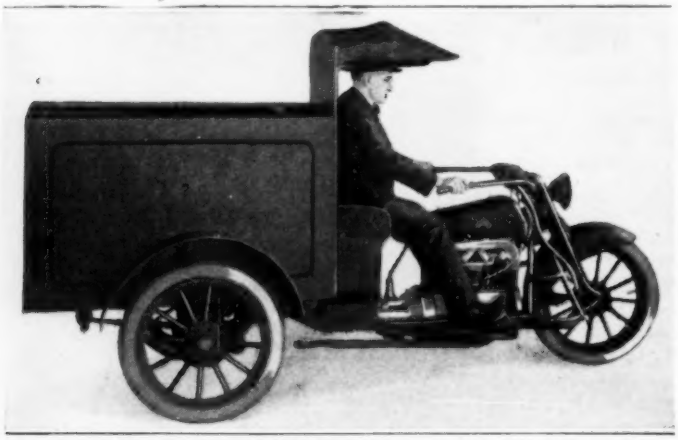
the inflammable compounds used in battery making and repair. A new 4-qt. melting pot for this use has a three-heat cartridge heating element in the bottom, and maintains the proper temperature indefinitely. A flange at the top provides a scraping edge, and prevents boiling over.

WETTEST REGION IN HAWAII TO GET BIGGEST RAIN GAUGE

Use of the largest rain gauge ever made has been found necessary on the lofty head of Mt. Waialeale, Kauai, Hawaii, called the wettest place in the world. Here the U. S. Geological Survey has previously kept a seasonal-type precipitation gauge with a capacity of 300 cu. in.; but local rainfall is so heavy, averaging 1.30 in. per day, that inspectors on their frequent visits have often found the gauge full to overflowing. The huge, barrellike container in the photograph has been made, in consequence, to replace the inadequate instrument.

NEW DELIVERY CAR RESEMBLES BOTH AUTO AND CYCLE

While a new three-wheeled delivery car is neither an automobile nor a motorcycle, it combines features of both machines.



Some Parts of This Unusual Delivery Car, Which Looks Like a Motorcycle, Are Identical with Those Used in an Automobile

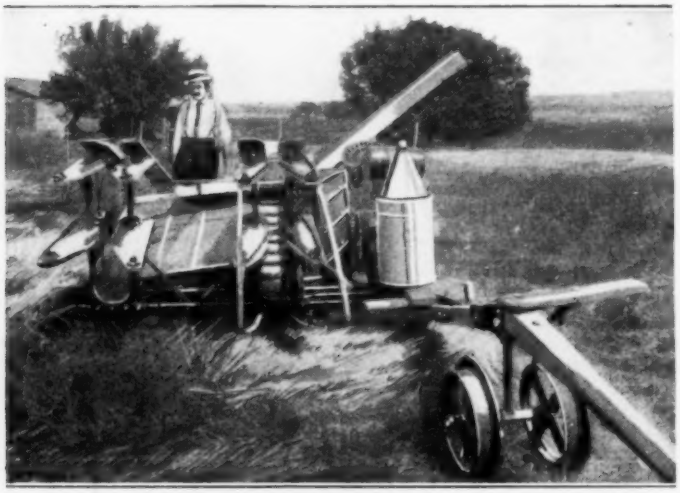
A four-cylinder motor propels the vehicle, power being transmitted to the rear axle through sliding gears, which are shifted by a hand lever. Attached to the handlebars is an instrument board, while back of the driver's seat is a commodious body.

"NC-4" MAROONED OVERNIGHT AT "DESERTED VILLAGE"

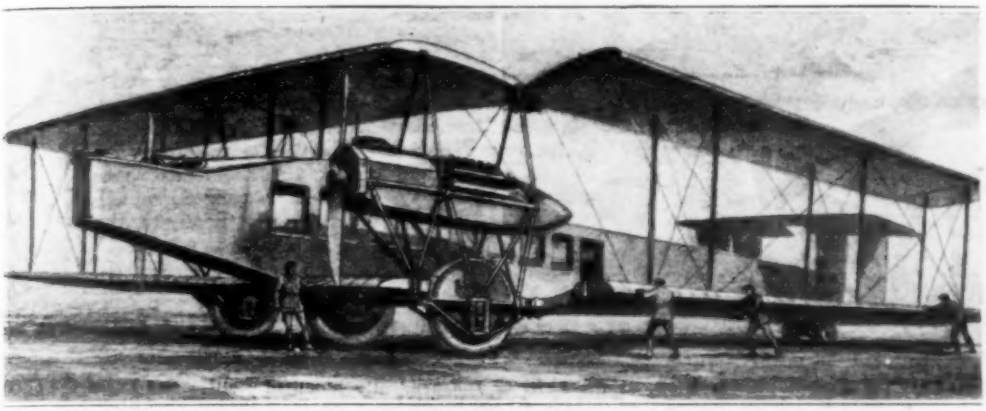
Although the "tale of the 'NC-4'" will always mean the story of the first transatlantic flight, Commander Read has lately written into his logbook some stirring epilogues. An interesting incident marked the recent flight from Galveston, Tex., to Mobile, Ala. When just west of the Mississippi Delta, the plane was caught in an impenetrable fog, that four times drove it to the water, and finally forced it to anchor off the gulf "town" of Grand Isle. The town exists only on the map, however, so the crew spent the night with the surprised lighthouse keeper. Meanwhile, worried naval officials searched the vicinity in vain with sub-chasers and seaplanes. But as the "NC-4's" radio is almost impotent when the plane is on the water, the mystery went unsolved until late the following morning, when the big seaplane resumed its journey.

CORNSTALK CUTTER MAKES SILAGE IN FIELD

From the cornstalks standing in the field to the filled silo in two automatic operations is the achievement of a Kansas farmer, who has invented a machine for cutting the silage in the field. Weighing less than 2,000 lb., the whole machine is easily drawn by two horses, and operated by a 4-hp. gasoline engine. As it is driven down a row of stalks, endless chains armed with spurs draw them in, and they are cut off and carried, top first, on a canvas conveyor to the cutting knives. Bent stalks or tangled weeds are untangled by a beating mechanism. The cut silage goes by way of another conveyor into the wagon that takes it to the silo, where a small engine and blower load it in as it arrives. The machine thus effects a great saving of time and man power.



Machine That Cuts Cornstalks and Immediately Converts Them into Silage: It is Operated by an Engine, but Drawn by Horses



To Remove One of the Power Units, the Hangar Men Swing Back the Hinged Wing Sections, and Take the Bolts from the Apexes of the Diamond Frames. The Unit is Then Lashed to a Supporting Cradle and Wheeled to the Repair Shop. Equipped with These Units, the Commercial Airplane of Tomorrow will Never be Withdrawn from Service Because of Engine or Propeller Trouble

AIRPLANE POWER UNITS MADE QUICKLY INTERCHANGEABLE

Transcontinental, multimotored airplanes that change power plants as the "Twentieth Century Limited" changes locomotives at division points, are foreshadowed by a patent granted a few weeks ago to an Englishman, famous the world over for his construction of mammoth airplanes. In brief, his invention consists of an engine which is inclosed, with the fuel tanks if desired, in a streamlined nacelle, and is mounted between two narrow diamond frames. Between the bases of these frames is fixed a single landing wheel. Propeller, motor, fuel tanks, and one landing wheel thus form a self-contained power unit.

To fit one of these power plants into the airplane, the outer sections of upper and lower wing are swung back on their hinges, and the unit wheeled into place. The apexes of the diamond frames are bolted into slots in the upper wing; then the hinged wing sections are swung back, and bolted into place again. The recess for the landing wheel, and the sleeves which receive the ends of the diamond frames, are contained half by the fixed portion, and half by the movable portion of the lower wing. Thus, in flight, the detachable power plant hangs from the upper wing; on touching earth, the landing wheel supports the unit, slight vertical play of the lower wing being permitted by the sleeves in the lower spars. For wheeling the units to and from the repair shops, the airdromes will have several cradles, on which the units will be overhauled, then held for further service.

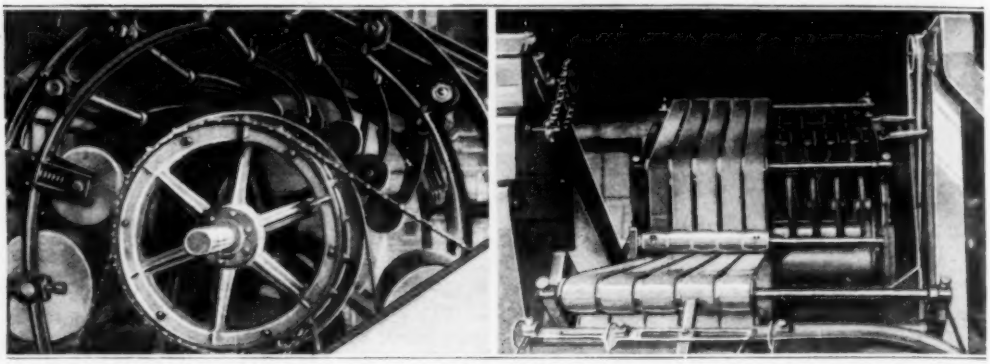
FAMOUS CHEMIST'S HOME TO BE MOVED TO COLLEGE CAMPUS

It is little known that, in 1794, Joseph Priestley, clergyman, chemist, and famous discoverer of oxygen, left his native England to spend his declining years in America. Choosing Northumberland, Pa., for his new home, he established his family in a dignified frame dwelling. This house still stands. It has now been purchased, however, by graduate chemists of the Pennsylvania State College, to be dismantled

This Frame House, in Which Dwelt Joseph Priestley, Discoverer of Oxygen, will Soon be Moved to the Campus of the Pennsylvania State College

shortly and moved to the college campus, 60 miles away. Here it will be reconstructed as a memorial to the famous Englishman.

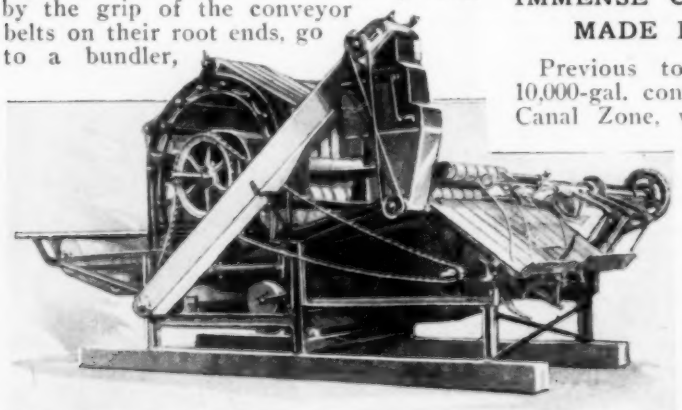
¶German railway signal lamps which smoked badly, because of the poor grade of petroleum available during the war, were cured by soaking the wicks before use in a 20-per-cent solution of nitrate of potash, and allowing them to dry. This resulted in great improvement.



Flax-Rippling Machine: Close View, at the Left, of Independently Mounted Rollers and Large Cylinder between Which the Berries are Crushed. At the Right, Conveyor Belts for the Flax Straws

NEW MACHINE RIPPLES FLAX WITHOUT DAMAGING STRAW

Rippling flax is different from threshing grain, because the straw is the important part of the flax crop, and its fibers must not be damaged. For this reason it is customarily done by hand, but a new machine, just tested by the Canadian government, gives promise of superseding the manual process. The stalks are placed parallel on conveyor belts which carry them around a large rotating cylinder. As they pass, a number of independently mounted small iron rollers crush the seed berries. The seeds are then shaken out by a vibrating grating, and the straws, still held parallel by the grip of the conveyor belts on their root ends, go to a bundler,



Complete Flax-Rippling Machine, Which Strips the Flax Straws of Their Seeds without Damaging Them, and Then Ties Them in Bundles

which ties them in sheaves. Flax, now grown only for seed in western Canada, is expected to supply great stores of material for cordage and bagging, with the help of this machine, considerably increasing the value of the crop.

MALT SIRUP TO TAKE PLACE OF HIGH-PRICED SUGAR

With a little additional equipment, mostly evaporating pans, any brewery now out of a job can manufacture malt-sugar sirup, a palatable, economical, and satisfactory substitute for cane or beet sugar in all their uses. This sweetener, long known to chemists but commercially new, has the approval of government scientists. Barley, formerly used for beer, is one reliable source, but corn, potatoes, or any starchy plant, can be used. The sirup, which does not readily crystallize, has a flavor similar to honey.

IMMENSE CARBOLIC-ACID TANK MADE FROM CONCRETE

Previous to the construction of a 10,000-gal. concrete tank recently in the Canal Zone, where the enormous container is used for the storage of carbolic acid, employed by local sanitary officials in the manufacture of larvicides, careful tests disclosed that the stonelike material is not affected by the chemical. Quantities of the acid were forced into hollow concrete blocks, made from mixtures containing varying amounts of cement and aggregate, and allowed to remain, under pressure, for several months. The blocks were then cut in two, and the pieces closely examined to ascertain the extent of penetration and disintegration. Practically no damage was done to the concrete.

MOTORIZING THE DOMESTIC ELEPHANT TO HUNT WILD ELEPHANTS

By H. E. JOHNS

HUNTING wild elephants in the veldt of South Africa from the saddle of a speeding motorcycle carried into the wilderness on the back of a domesticated elephant—this is the plan for the production of motion-picture thrillers to be carried out by a famous big-game hunter, who left Los Angeles recently for India and Africa, with a corps of motion-picture actors and photographers.

The Domesticated Elephant, Prepared to Carry the Motorcycle to a Point in the Jungle Where It can be Used to Advantage for Pursuing the Wild Animals

Much of the elephant pasture of South Africa, according to the hunter, is smooth, open grass land where the motorcycle-mounted hunter would find little difficulty in driving at full speed. This fact alone, he declares, will not only enable one to run down his quarry, but will make wild-elephant hunting infinitely safer by providing a means of flight at a greater speed than that of the "wildest" of wild elephants. To get to the hunting grounds, he proposes to journey into the wilderness by elephant, but with a light-weight motorcycle slung over the side of his big pachyderm. Once in the veldt, and after having sighted a herd of wild elephants, the motorcycle will be lowered to the ground. Then the hunter will go after them across the grass land with the speedy little machine, bringing down the big game with a swivel-mounted rifle on the handlebars of the machine.

In order to demonstrate the feasibility of the plan, some interesting experiments were conducted recently near Lankershim, Calif., "Charles Bullephant," the biggest pachyderm in the zoölogical collection of a film company, was taken into the Tejunga Valley, which closely resembles the South African veldt, with the motorcycle slung on his side. After the big beast had conveyed the little machine through the tangle of brush and vegetation with which part of the valley is overgrown, the motorcycle was lowered to the ground. Mounting it, the hunter sped across the grassy meadows with a number of cowboys on fast horses as hunting quarry for practice purposes. He had little difficulty in overtaking the horses and taking several shots at them with blank cartridges.

The Heavy Motorcycle Is an Insignificant Burden to the Huge Beast, Whose Objection to It, Based on Purely Temperamental Grounds, was Finally Appeased with Peanuts and Liberal Applications of the Goad

Several amusing incidents in connection with the mounting of the motorcycle on "Charles Bullephant's" back occurred. The weight of the machine was a mere trifle compared with the big beast's strength, but he never was particularly fond of motorcycles anyway, and objected to having it slung on his side. Finally his objections were

overcome by his trainer, but no sooner did Mr. Bullephant get on his feet before he let out an elephantine snort, figuratively "kicked up his heels," and was on his way! He succeeded in shaking off the motorcycle before he was recaptured. In the second attempt "Charles" adopted new tactics, and attempted to eliminate the motorcycle by rolling upon it. In this he was unsuccessful, but after his 1,750 pounds had massaged the machine three or four times, the little vehicle was pretty thoroughly flattened out. After another motorcycle had been procured, peanuts and a liberal application of the goad effected Charles' good behavior, and the experiments were carried out without further objection on his part.

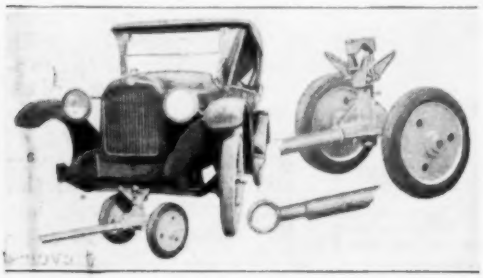
For use in Africa, the big-game hunter will have made a special howdah with block and tackle davits for handling the motorcycle on the elephant's back. This howdah will have a compartment on the other side for carrying an amount of luggage that will counterbalance the weight of the motorcycle.

SIMPLE DANGER SIGNS APPEAR TO BE ELECTRICAL DEVICES

Nonmechanical warning signs along a southern California interurban railroad appear to be electrically operated devices, which function only when danger is great, and as a result, are heeded more than otherwise would be the case. However, the contrivances simply consist of a wooden block, bearing the word "stop," supported by two iron-pipe standards over a cautionary placard, and are in no way changing.

BROKEN AUTO'S TRIP TO SHOP MADE EASY BY SMALL TRUCK

Jury rigs of various sorts are no longer needed for getting an auto with a smashed wheel to the repair shop. A pair of cast-steel wheels, a foot or so in diameter, with 3-in. solid-rubber tires, on a short axle with a long tubular draft bar, make up a new form of wrecking truck that is always ready. Its feature is a patented four-arm saddle and clamp that fit the front or rear axle of any car.



Little Wrecking Truck with Patented Saddle and Clamp Which Fit Either Axle of Any Auto

MULTIPLEX RADIO-TELEPHONY GUIDED BY SINGLE WIRE

Wireless telephony over a wire, a scientific paradox, becomes a practical achievement of immense value with the recent completion of a series of experiments conducted by Maj.-Gen. George Squier, chief of the U. S. Signal Corps. The most remarkable feature of the new system is its ability to carry ten or more simultaneous conversations along a route consisting of a single conductor. The original conception, revealed in 1911 by patents assigned to public use, was described in Popular Mechanics Magazine for March of that year. The war interrupted its development, but now such progress has been made that preparations are under way to install the first line between New York and Albany. The secret of the process is the use of high-frequency vibrations as vehicles for the lower voice frequencies, the wire functioning as a nucleus for the waves and guiding them to their destination. Speech over greater distances than any yet achieved is believed possible by the new method.

WRECKED VESSEL DEMOLISHED BY STORM-DRIVEN WAVES

Seven hours after the four-masted schooner "James Slater" stranded on a bar off Cape Cod recently during a terrific winter gale, practically all that remained of the vessel were small bits of

Wreck of the "James Slater:" The Four-Masted Schooner was Stranded by a Gale, and Torn to Pieces by the Waves. Bales of Wood Pulp, with Which the Vessel was Loaded, and Other Wreckage were Strewn along the Beach for Miles

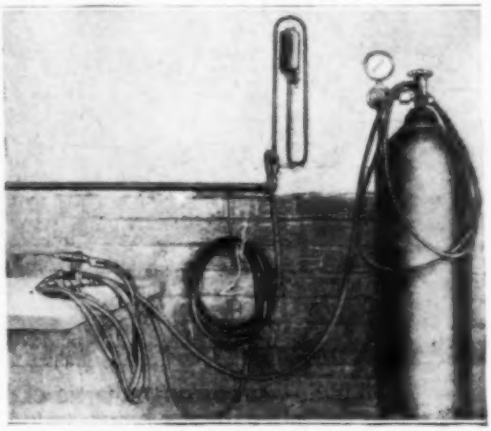
wreckage, scattered for miles along the beach near the scene of the disaster. The ship went aground at two o'clock in the morning, when the steering apparatus was rendered useless by ice. A blinding snowstorm and inky darkness impeded life-savers who went to the rescue of the six men on board, and it was not until a few minutes before the boat went to pieces that the captain and crew were brought ashore in a 13-ft. dory, which was pulled back and forth between the wreck and the land by means of a line. The latter was shot across the intervening water by a life-saving mortar. The schooner was en route to New York from a Nova Scotia port with a cargo of wood pulp.

ANIMALS' NERVES GRAFTED TO SOLDIERS' LIMBS

An interesting phase of the reconstructive surgery practiced at army hospitals is the grafting of animals' nerves on shell-torn, paralyzed soldiers. Usually, when a nerve has been severed by a shell fragment, the ends can be sewed together. But often a considerable length of the nerve is missing. In treating such a case, the surgeon takes a proper nerve from cold storage or chemical preservative, sews it into the gap, and after a few months, the patient regains control of the "dead" limb. In one typical case, full sensation is reported to have returned in six months.

INEXPENSIVE LEAD-BURNING OUTFITS NOW ON MARKET

Manufacturers and users of acid tanks, chemical apparatus, and other lead work that must be autogenously welded, will be interested in the appearance of three compact and inexpensive lead-burning outfits. Each comprises a lead-burner's torch, bench control block, hose, pressure regulator, and gauge. The buyer has a choice of three outfits, equipped for burning different gases. One set, popular for storage-battery connection work, is fitted for city gas. The others are adapted for acetylene and hydrogen.



This Outfit, Including Torch, Bench Control Block, and Accessories, is Meant for Use with City Gas. Cylinders are Obtained from the Regular Gas-Service Stations

ENVELOPES MADE IN MILLIONS BY MODERN MACHINERY

It seldom occurs to the careless user of the modern letter envelope, sold almost as cheaply as the sheet of paper from which it is made, that it is a machine product, requiring complicated equipment for its manufacture. The highly developed envelope machines, operating automatically, literally complete their product in a continuous stream, with their flaps gummed and creased, and all neatly arranged ready for packing by the carriers which feed them out.

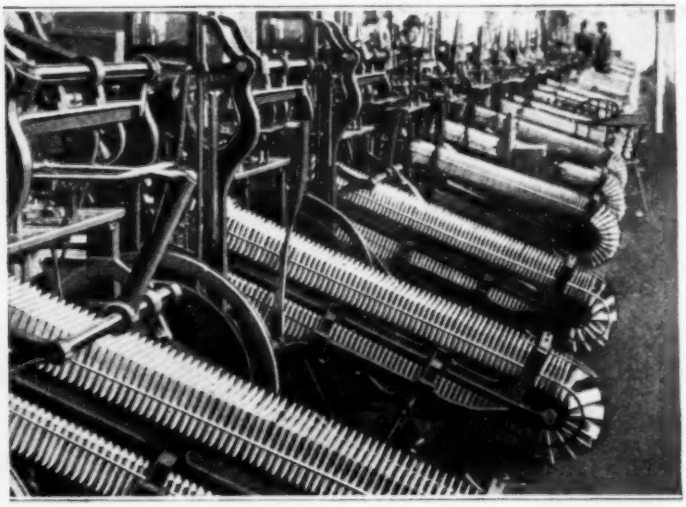


PHOTO BY GILLIAMS SERVICE

Automatic Machines Which Manufacture Paper Envelopes Literally by the Million, Turning Out Their Product in an Endless Stream

ASTRONOMERS SEEK PLANET BELIEVED NEAR NEPTUNE

A supposed planet, near Neptune, and 55 times as far from the sun as is the earth, is the object of a search now being conducted by American astronomers. Perturbations of near-by planets have long convinced the profession of its existence, and since 1877 many observers have tried to locate it. As it is thought to be of the fifteenth magnitude, and several thousand times too faint to be seen by the naked eye, these latest investigations are being carried out by means of the camera. Taking repeated telescopic photographs of a certain small area of the heavens, the astronomer places one plate on top of the other. Relative motion thus becomes apparent at once. It is now reported that the probable position of the new planet has been plotted by this method.

¶ Enlisted men of the army will soon be wearing a new all-purpose shoe, fit for field, marching, or dress purposes. It is really the well-known "field shoe" improved.

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AUTOMOBILE WINS CLOSE RACE WITH ICE BOAT

THE exciting finish of a recent race between ice boat and automobile has been caught above by a high-speed camera. It will be seen that, for all the ice boat's speed on the straightaway, the superior maneuverability of the automobile has brought it across the line a few feet in the lead. The scene of the novel competition was the mouth of the Navesink River, near Red Bank, N. J. The steamer at the right is locked in place for the winter by the ice.

COMMENT AND REVIEW

[These pages were printed Jan. 24, 1920]

THE progress toward the restoration of pre-war conditions which Belgium has already accomplished is little less than marvelous. In less than a year, her coal production—the basis of modern industry—reached 90 per cent; sugar refineries, 100 per cent; cotton looms, 60 per cent; wool products, 75 per cent, and shoes, 70 per cent. Even steel production which suffered most, reached 30 per cent.

What Belgium has Done

When Germany seized and carried away the machinery of Belgian factories, the confident expectation was to so crush out industrial production as to leave the Belgians reduced to agriculture. But the tide which ebbed so fiercely has been flowing back, until of 9,797 machines of which a record was kept, there had, by the end of 1919, been returned 5,069 machines, and the remainder was still coming back at the rate of 30 carloads a day. During the war 1,366 miles of railroad track and 1,419 bridges were destroyed, and already these have been reconstructed.

We are accustomed to think of China and Japan as densely settled countries, but in 1913 Belgium was the most densely populated and intensively cultivated country in the world. Its 11,373 square miles make it about the size of Maryland, with one man in every six a land owner. To such perfection had agriculture been developed that three-fifths of the total area was under cultivation, producing an average of $100 per acre—a record equaled by no other country. A 60-mile pipe line for pumping beet juice from 14 gathering stations to the sugar refineries, illustrates the advanced development of its agricultural industries. In devastated farm lands Belgium was fortunate in losing only 70,000 acres—less than one per cent of its total area.

Freedom from general strikes and a national determination to restore normal exports, on which the country so largely depends, are hastening a return to prosperity; and wages have been materially increased, but are still low compared with other countries, as pre-war standards were maintained up to the time of the armistice. Instead of the spirit of extravagance which prevails in some other countries, the Belgians preserve that same national thrift which for so many years made it famous as affording the best living for the least money of any country maintaining modern conditions. Another year or two will almost restore pre-war production in most lines.

A MONTH ago these pages chronicled what was in many respects the most extraordinary event in the entire history of this country—the banishment and deportation of a considerable body of arch traitors. A feeling of approval and satisfaction swept across the entire country; even those few who disapproved, for personal reasons, dared not do it openly. What all loyal Americans had long hoped and prayed for was at last an accomplished fact, and the promise that the good work so successfully begun was to be at once repeated, and then maintained until we were rid of the red menace, was accepted as evidence that a long-suffering and over-patient Government had at last really awakened from its sloth and lethargy and exerted its right and might.

Keep Them Going

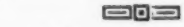
Each day millions read their daily papers in the hope of seeing the promise fulfilled. And each day for a month we have looked in vain. A nation-wide "raid" which gathered in hundreds of the undesirables was made, but as yet no second ark has sailed. Instead those who yesterday were calling down anathema upon our courts and laws, are today using every advantage of legal technicalities in a frantic effort to avoid the sentence which their very acts should pronounce upon themselves. We are too thin-skinned, or there is too much politics being employed, when a traitor who has shouted his infidelity from the housetops, can get his "case" juggled into the ordinary processes of law, and dragged out indefinitely. It is almost enough to make one even wish for that autocratic and hair-trigger efficiency of a monarch or a czar, which, with all its faults, did have the advantage of making short shrift of traitors. A happy medium with us would be

sufficient, but it might well err toward the side of a court-martial, which is noted for action, rather than the canal-boat speed to which we often limit ourselves.

When a man has taken deadly poison, has all the symptoms of being poisoned, himself declares he is poisoned, his physician does not take his case under advisement for a month or two, does not continue his case from week to week, nor does he permit the patient to engage experts to prove he isn't poisoned. He gets busy right away; he doesn't waste a moment, and he gets the poison out of the patient and administers the antidote. What we need is to get the red poison out of our country, by prompt deportation, and for each one who goes out that way the antidote will be efficacious for a hundred who are left. But to be effective the treatment must be prompt.

When a man is found merely watching a band of counterfeiters at work, the secret-service agents have a right to assume he is one, too; if the man declares he is, and believes in counterfeiting, he is entitled to be taken at his word. The man or woman who declares, or writes or prints, a desire to overthrow our Government, by that act pleads guilty to being a traitor, and should be given a traitor's deserts; and instead of waiting for a soviet condition here, be hurried to the place where he belongs, and where that condition already exists.

Ships are leaving our shores by hundreds every week; the sailing is good now, and we hope to chronicle the departure of, not a well-filled, but an overcrowded "ark" next month.



Reforming the Radicals

A JUDGE, occupying a bench in our own state, we regret to admit, in a recent address takes the almost solitary position among thinking people, that the radical reds should not be deported, but instead educated in the ethics of true Americanism. To which another judge voices the sensible and practically unanimous opinion, that "You may as well try to teach a rattlesnake to sleep in a cradle with a baby as to try to educate an anarchistic radical."

In brief, the question of education is by no means being neglected in the opposite direction. In many of our large cities the children of the radical element are being taught disloyalty in their so-called Sunday schools. To counteract this effort either with the individual child, or a group, is not easy on account of the opposition of the parents. Hence we find children at that most impressionable age, and before they are sufficiently mature to weigh and balance ideas on their own account, guided along a path of prejudice and error, from which it may be hard to turn them in later years. The dyed-in-the-wool adult radical is about as susceptible to argument, reason, and history as a duck's back to a drop of water. He "knows," or thinks he does, and this type of stony mentality is precisely like the horse who will not drink.

Probably we have counted too much on the uneducated foreigner comprehending and appreciating the freedom and opportunities of America. In hostility to this idea is the constant harangue of the soap-box orator who in his vehement utterances transforms ant hills into mountains. No rose ever bloomed and no sunset ever spread its gorgeous tints, that some one could not declare contained a flaw, and find followers to agree with him. Has it ever occurred to you that in all the propaganda, spoken or written, the radical never finds words to mention the good and generous things of American life? Its free day and night schools; its hospitals and clinics; the libraries, art galleries, and museums; lectures both educational and entertaining; parks and bathing beaches; summer places for sick babies; country trips for city children; free ice and milk for the very poor, and the innumerable private, public, and city organizations constantly doing charitable work of every kind throughout the year. As for those radicals on whom all this is lost, it is a hopeless task to work a reformation in time. Accustomed in the place whence they came to respect only the strong arm, it is futile to hold out olive branches here. The only remedy is to weed them out, and in self-respect and self-preservation apply unrelentingly that only appeal they recognize or seem to understand.

We have doubtless been sadly remiss in our public schools, teaching German, for instance, where we should have taught patriotism. The adult foreigner does not largely attend the public school, but his children do, and it would seem easier to reach the parent through the children than in any other way. It would be no sacrilege, but rather a pious devotion if, on the opening of every public and

private school each morning throughout the land, teacher and pupils should rise and facing the flag repeat a sort of Apostles' Creed of American patriotism. The "I believe," stretching unbrokenly from kindergarten to last-year High, might easily be worth as much as all the studies of the 10 years' course.

THE good ship "Buford," after an uneventful voyage, which was also our most notable maritime event since the "Mayflower," finally made port at Hango—gruesomely suggestive name—and safely debarked its passengers. The Finland skies and climate of Hango, in January, has little in common with the home port of the original ark which is reported to have landed on a beautiful spring day under the eternal promise of a rainbow, while hope and joy filled every living heart. For reasons not stated in the cables, the Hango Silver Cornet Band was conspicuous by its absence. Neither did the burgomaster deliver the usual and tiresome platitudes tendered arrivals of quality, or present the key to the city gate, nor offer its freedom. Indeed, the only freedom was that of occupying—under guard—the perfectly good box cars in which were temporary tables, benches, and bunks of plank. The whole setting was suggestive of a lack of appreciation on the part of the Hangoans of the importance to the world of these whiskerites, who had undertaken to revolutionize and reform a mere hundred million.

The Ark Lands

Then followed a tedious delay of many hours, during which the master of ceremonies is said to have incurred gray hairs for fear the gate to Russia might refuse to open. With a hard winter coming on, the Finlanders seemed to discourage immigration.

Finally the box-car special moved slowly eastward only to incur another long delay at Viborg, 50 miles from the boundary. At last, however, this personally conducted tour came to a halt at the border, where the visitors crossed a large bridge—a Bridge of Sighs, as it were—and entered Russia.

Here also was displayed a lamentable lack of hospitality, instead of which the excursionists were submitted to a rigid process of personal examination which was really annoying, and quite unexpected.

Neither Lenine nor the prime minister was there with the glad hand, but what mattered that—they were at last in that haven of rest and promise, Dear Old Russia; or the Reds in Redland. We may now reasonably hope that the national lassitude and reluctance to take part in government affairs which has characterized the past two years there, may find some improvement. When Emma addresses the populace from the front steps of the Winter Palace, maybe she can put a little American pep into things. Speaking of Emma, her last words before crossing the boundary, are probably sincere: "I am anxious about what is ahead in Russia, but naturally I am leaving very much behind in America."

And this at the end of only 30 days. Fie! fie! Emma.

DURING the past five months the wholesale prices of beef at the Chicago packing houses have declined 35 per cent. At last reports the retail markets had not hung out any extras announcing a similar reduction on their part. One large packer declares the explanation is found in the almost universal demand to have only the choicest parts, of which there are not enough to go around. As to hams, and pork chops, and loins, he declares nothing short of an eight-legged porker could meet requirements, and if the increased demand of the past year continues long, a pig will need as many legs as a centipede. Everybody wants the choicest cuts of beef, of which only a limited amount can be carved out of any one animal. The meat business is the only very large industry which has no middlemen, being delivered direct to the retailer in all parts of the country by packing-house employes. The dressed meat is actually sold to the retailer for less than it cost on the hoof, the long list of by-products, in which nothing is lost, absorbing the difference, and leaving the packers a margin of one-half cent per pound. And still the consumer continues to pay a high price for both best and less desirable cuts alike.

A Packing-House Discovery

H. H. WINDSOR

SIMPLE TOLL-MESSAGE TIMER FOR TELEPHONE EXCHANGES

Equipment for keeping track of long-distance messages handled by telephone exchanges usually requires a complex clock-operated stamp for marking the toll ticket. An inexpensive arrangement now on the market, particularly suitable for small exchanges, consists merely of a clock with dial numbered in minutes, a counter, a dating stamp, and a set of toll tickets. The base, which serves as a writing board, fastens at the side of the switchboard position. The operator easily reads the exact time of the start and finish of each call, and marks them on the ticket, the counter registering the number of calls.

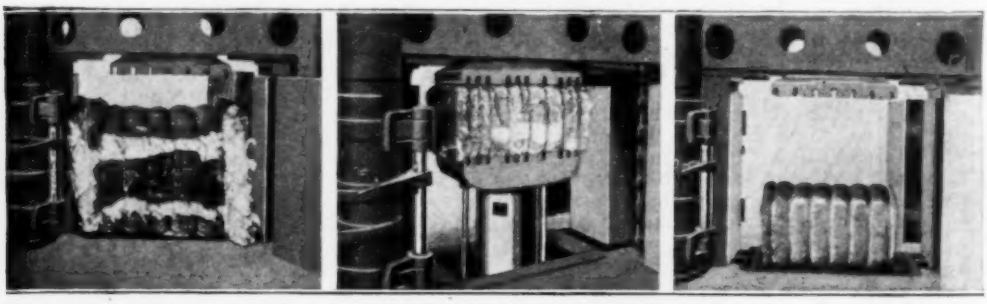
DENSE COTTON BALES MADE BY THREE-RAM COMPRESS

Cotton bales of high density and uniform dimensions are turned out by a new electric compress, which, unlike the old-style, one-ram machine, applies pressure simultaneously from five sides. Placed on the bottom platen of this improved press, the bulky bale from the gin is squeezed, by two heavy steel doors, to the desired width. At the same time two horizontal hydraulic rams compress it to the desired length. A pull on a second control lever then elevates the bottom ram until the proper thickness is reached. All these operations are accomplished in 16 seconds. The two side doors being swung open, wires are passed through slots in the upper and lower platens, and the bale is bound for final shipment. Uniform compression, in this way, to an average size of 24 by 54 by 21 in. permits the loading of fully 60 per cent more in freight car or ship's hold.

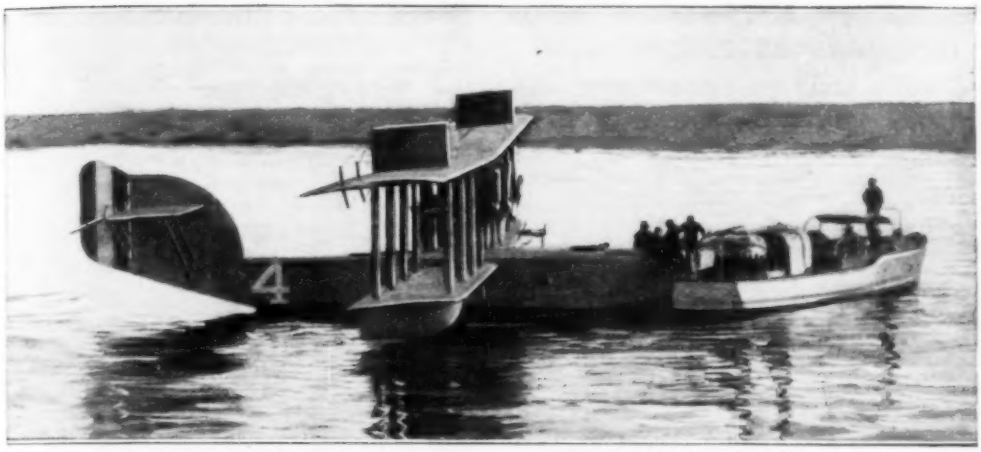
VALUABLE PINE RESIN MINED FROM NEW ZEALAND SWAMPS

The gum, or resin, from the kauri pine tree of New Zealand, used in the manufacture of varnishes, paints, oils, and turpentine, is now worth about $1,000 a ton. World-wide interest attaches, therefore, to the recent discovery that the great peaty swamps north of Auckland are richly sown, to a depth of at least six feet, with loose particles of the substance. One small mill is already in operation about 100 miles from Auckland. Here the peat is excavated and retorted, finally yielding up to 70 gal. of crude oil to the ton of soil. It is noteworthy, also, that deeper excavation in one part of the swamp has uncovered a large forest of prehistoric kauri trees. Submerged thousands of years ago, probably by some seismic disturbance, the trees are still in good condition. Many of the logs have been taken out, sent to the sawmill, and worked into lumber.

¶American exporters are advised by the Forest Products Laboratory to attach handles of webbing to heavy boxes and crates. Webbing is more easily attached to the container and occupies less space than the usual rope handle.



The Steel Doors are Shut upon the Shapeless Bale, at the Left, and Rams Close upon It from Sides and Bottom. Compressed, the Bale is Then Held, as in the Center, While Wires are Passed through the Platen Slots. The Finished Bale is Seen at the Right



MAIL PLANES KEEP ADMIRAL IN TOUCH WITH HIS FLEET

LOADED with official communications from the Pacific fleet at San Diego, Calif., the big navy flying boat has just come to rest in San Pedro Bay. Gone out to receive the mail sacks is seen the motor launch from the admiral's flagship, the U. S. S. "New Mexico," moored 150 yd. distant. This aerial mail service for the fleet is now well established. Each morning this and another twin-engined boat make the 100 miles between the two anchorages in an average time of 70 minutes. The return trip is made in the afternoon.

MAY MOVE BRAZILIAN CAPITAL TO HIGH LAND OF INTERIOR

A remarkable plan for the wholesale transfer of the Brazilian capital within the next five or six years from Rio de Janeiro to a high plateau in the inland state of Goyaz, is now agitating the federal senate. If the bill becomes law, the project will be advertised throughout the world for two months; then, for half a year, the government will receive competitive proposals from architects and contractors. Five years after the signing of the contract the made-to-order capital is to be completed in every detail, including great legislative and administrative buildings, schools, libraries, theaters, a penitentiary, hospital, barracks, markets, post offices, telegraph and telephone offices, etc. It is also stipulated that the successful bidder shall enjoy for 20 years an absolute monopoly of water, drainage, lighting, telephone, and urban traffic services in this city of his creation. For the construction of necessary railways, however, the government is to be directly responsible.

NEW RECEPTACLE FOR STREET WASTE MADE OF HEAVY STEEL

Unusual street-corner "waste baskets" that are easily emptied, hard to knock over, and able to withstand the roughest sort of usage, are now being tried out in Philadelphia. The case, or frame, is made of thick steel, riveted, square in cross section, and stands about four feet high. The receptacle proper is a burlap bag that hangs from a removable collar. Covering the bag is a semicylindrical sheet of steel, which is hinged at one side.

The Heavy-Steel Waste-Paper Receptacle at the Left is Undergoing Trial at Philadelphia. At the Right is Shown How the Burlap Bag may be Removed, Making Collection of the Contents Easy

MODEL OF MT. WILSON MADE OF SUGAR BY PASTRY CHEF

Two hundred pounds of sugar were transformed into a remarkable model of Mt. Wilson, Calif., by a skillful eastern

Sugar Model of Mount Wilson: On Top of the Miniature Peak Is an Observatory, While on Its Sides Are Tiny People, Buildings, Bridges; and Flowers

pastry chef, who spent his spare time during two months on the task, which he completed recently. Surmounting the confectionery peak is a miniature astronomical observatory, made from sugar, while on the sides of the eminence are tiny people, buildings, bridges, flowers, and butterflies, fashioned from the same material. Electric lights are installed on the diminutive mountain, which is 5 ft. in height and 7 ft. through at the base.

RACIAL BLOOD TESTS SUGGEST DUAL ORIGIN OF MAN

That the Asiatic and African peoples originated independently of the European, is the startling suggestion recently put forward by two Swiss serologists, who made extensive blood tests of the many nationalities brought together in Mesopotamia during the world war. Examining and classifying the blood elements of the native population, of Jewish refugees, and of soldiers assembled from every corner of the earth, they were surprised to find the nationalities dividing, of themselves, into three distinct classes. A first group included the soldiers from England, France, Italy, Greece, Bulgaria, and Serbia. An intermediate group contained Arabs, Turks, Russians, and Jews. In the third group were Negroes, East Indians, and natives of Indo-China and Madagascar. Reason for their suggesting the dual origin of man is obvious; the intermediate group represents, of course, a fusion of the two archetypes.

BLIGHT-FREE BEANS PRODUCED BY PLANTING AGED SEED

Bean plants grown from old seed are unlikely to be affected by bacterial blight, according to horticulturists who have been conducting tests at the Oklahoma Agricultural Experiment Station. The experts obtained the most satisfactory results with seed gathered two or three years previous to the time of their planting. Older seeds produced blight-free plants, but in many cases failed to germinate. All of the aged seed was planted on uninfected land, located at a distance from infected patches.

REFRESHMENT TRAY ON AUTO ADDS TO SODA-WATER JOY

When there are ladies in the auto party, stops at sundry soda fountains along the way are inevitable. To cap the climax of their comfort, when the beverages are "brought out," a Nebraska inventor has designed a tray with a clamp that holds it firmly on the edge of the car and adjusts it to the level of a table. Ownership of this addition to motoring joys is intended to rest not with autoists, but with the proprietors of ice-cream parlors.

Refreshment Tray That Clamps on the Edge of the Auto: The Ice-Cream Man Sends It Out with the Sodas

INTERNATIONAL PARCEL POST IS GREATLY EXTENDED

International parcel-post service has been greatly extended. Parcels within the 11-lb. limit may now be sent to Siam, Iceland, Palestine, Mesopotamia, Union of South Africa, Luxembourg, Paraguay, Algeria, Corsica, Tunis, Egypt, British India, Syria, British East Africa, Uganda, Malta, Spain, Balearic Islands, Canary Islands, Northern Africa, Trentino, Trieste, Belgian Congo, Islands of Zanzibar and Pemba. Roumania is open to 22-lb. shipments. Italian Somaliland (Benadir), Erythrea, and Libya (Tripolitania and Cyrenaica) are handled under conditions applying to Italy. Service to Belgium, Chile, Denmark, Germany, German Austria, Czecho-Slovakia, Greece, Liberia, the Netherlands, Norway, and Sweden has been resumed. To Brazil, British Honduras, China, Colombia, Guatemala, Republic of Honduras, Nicaragua, Peru, and Argentine Republic, 22 lb. is now the limit.

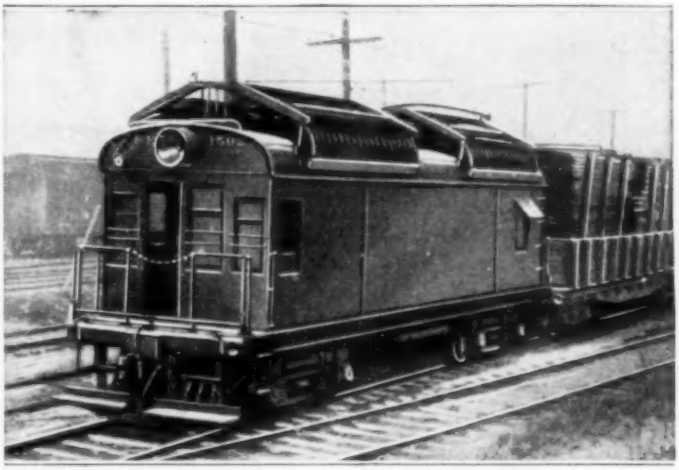
KNOCKED SENSELESS BY GOOSE, AIRMAN FALLS 3,000 FEET

While flying at 4,000 ft., en route to his airdrome at Portland, N. D., some weeks ago, an airplane pilot encountered a large flock of Canadian "honkers," and attempted to clear them by a steep dive. Three of the big birds were caught between the upper and lower wings, however. One of them collided with the pilot's head, and fluttered into the cockpit, as the pilot sagged forward, unconscious. Ignorant of the mishap, the mechanic in the other cockpit was alarmed, next moment, to feel the plane pass out of control, and into a tailspin. Three thousand feet the men fell this way, a crash seeming inevitable. Luckily, at 1,000 ft., the pilot came to and righted his ship.

¶A flying boat recently landed on the ice at Raritan Bay, N. J., then took the air again without mishap. The stunt was repeated several times.

COMBINATION LOCOMOTIVE HAS GAS AND ELECTRIC MOTORS

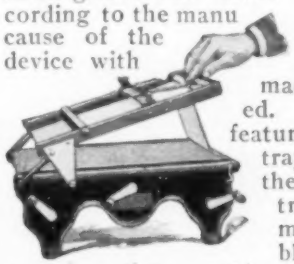
Running from an electrified section of railroad to a steam section and back again has no embarrassments for an electric locomotive lately placed in service to meet special conditions in southern California. A powerful auxiliary gasoline engine is a feature of the big machine's equipment, and when the trolley quits, the cylinders are started into action. With this combination of power it is capable of transferring 20 to 30-car trains from the steam-line tracks to the electric.



Though It Looks like a Conventional Type of Electric Locomotive, This Big Tractor Carries Gasoline Engines Also, Enabling It to Change from Steam Tracks to Electric without a Stop

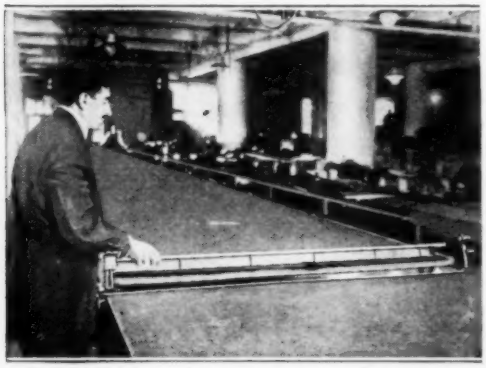
NEW LETTER-COPYING MACHINE HAS SELF-FEEDING DEVICE

Rapid production is possible with a new gelatin-roll letter duplicator, according to the manufacturers, because of the self-feeding device with which the machine is provided. This novel feature is a metal tray, pivoted over the bed of the contrivance. The master copy and blank sheets are transferred from this receptacle to the roll by pushing down the free end of the tray, and pressing on a spring. This causes one end of the bottom sheet to adhere to the roll. When the tray is raised, the sheet is spread on the duplicating surface.



CLAMP HOLDS AND REGISTERS CLOTH ON TAILOR'S TABLE

To replace the iron bars and miscellaneous weights that were formerly used in tailoring establishments to hold layers



The Tailor is Saved Many Mistakes and Much Tiresome Lifting of Weights in Laying Out Cloth, When the Cutting Table is Equipped with This Combination Clamp and Counter

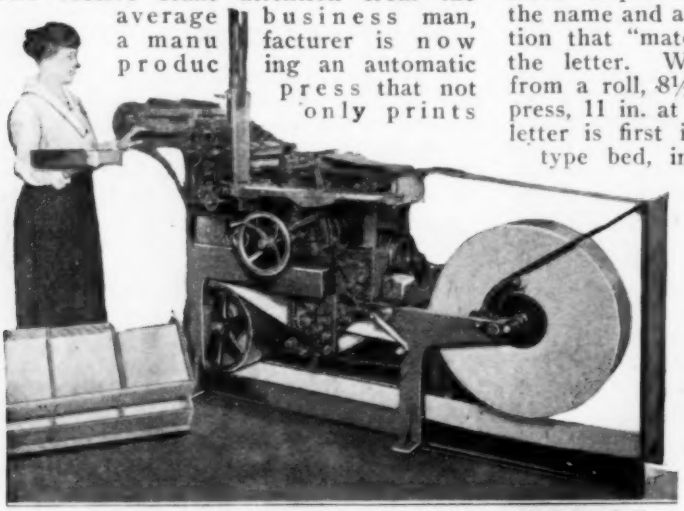
of cloth upon the cutting table, there has now been developed a simple clamp with counting attachment. Attached across one end of the table top, the clamp consists essentially of two arms, which are pivoted to upright brackets and connected by an iron crosspiece, or blade. When cloth is to be laid out, one end is placed before the clamp; the crosspiece is pressed upon the cloth, and a cam lever is thrown to lock the blade in place. The last operation actuates the little recording instrument attached to one of the upright brackets, where it is easily seen by the tailor.

FIGHTING FOREST FIRES BY BOMBS IMPRACTICAL

So many persons have lately proposed the use of gas bombs, dropped from airplanes, as extinguishers for forest fires that the U. S. Department of Agriculture has been moved to official pronouncement that the scheme is impractical. It is pointed out that a forest fire is not to be poisoned; rather it must be smothered by a thick blanket of some inert gas like nitrogen or carbon dioxide. Doubtless one part of virulent poison gas to 1,000,000 parts of air will effectively kill soldiers; but 750,000 parts of inert gas to 1,000,000 parts of air would probably fail to extinguish a blaze. The difficulty of dropping the bombs accurately, the diluting effects of air currents, and many other complications, unite to make such a concentration, even in a most limited area, quite impossible of achievement. The aeroplane, however, will continue to play its part in the forest-patrol work.

PRESS PRINTS, ADDRESSES, AND SIGNS LETTERS

Believing that "filled-in" circular letters receive scant attention from the average business man, a manufacturer is now producing an automatic press that not only prints the colored letterhead and signature, but, more important, actually "typewrites" the name and address in a color and position that "match up" with the body of the letter. When in operation, paper from a roll, 8½ in. wide, is fed into the press, 11 in. at a time. The body of the letter is first imprinted by means of a type bed, inked ribbon, and moving roller. The name and address, on a small zinc plate, having fallen into place meanwhile, the ribbon and roller then print the "fill-in" in exactly the right place and color. The paper strip passes next into a cylinder press, where it takes impressions from two electrotype plates, one for the letterhead and one for the signature. A knife then cuts the paper to size, and the

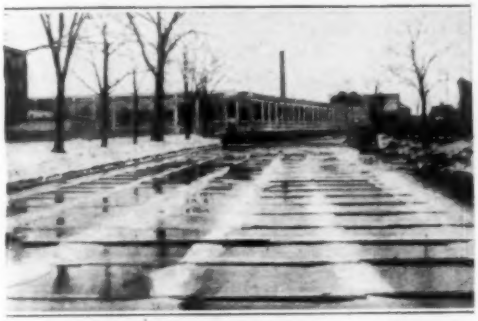


At the Rate of One Letter Every Second, Blank Paper from the Roll at the Right is Converted into Typewritten Letters with Uniform Head and Signature, and with Names and Addresses That Match the Body

letter is ready for mailing. The machine may be used, also, as an ordinary press, as an envelope and wrapper machine, or for ruling and cross-ruling order blanks.

BOARDS IN CANALS PREVENT SPRINGTIME ICE JAMS

"Reinforced ice" will never attain the industrial importance of reinforced concrete; yet it is seen increasingly each winter in the water-power areas of New England. With the approach of cold weather, inch boards are fastened, checkerboard fashion, along the surface of the canals which feed the turbine wheels. At the first cold snap these boards are frozen into the ice. When a thaw comes they hold the ice in place, preventing a general break-up, and so



Frozen into the Surface of This Canal are Seen Numerous Boards. In the Springtime These Prevent a General Break-Up, with Consequent Loss of Power at the Turbine Wheels

doing away with the risks of local floods, broken wheel gates, and diminution of water supply to the turbine wheels.

THREE-PURPOSE SPARK PLUG TOOL IS SIMPLE DEVICE

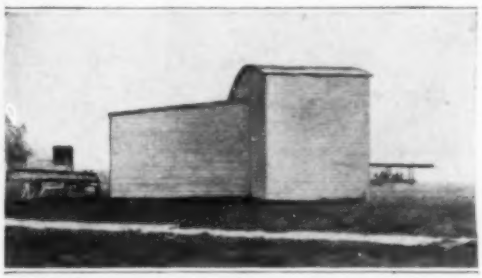
Spark plugs can be tested, cleaned, and adjusted with a simple tool now on the market. Ignition-system trouble is located by means of a variable spark gap, provided between a metal-tipped lever and a slotted connector, both of which are mounted on the wooden handle of the

This Single-Handled Tool Serves to Test, Clean, and Adjust Spark Plugs

device. A socket in one end of the contrivance holds a combined steel-wire brush and scraper. The latter also serves as a gauge for setting spark-plug points.

PLANES HOUSED IN SEPARATE SHEDS TO CUT FIRE RISK

Great fireproof hangars, with rolling partitions that quickly isolate a burning airplane, are far too expensive for the

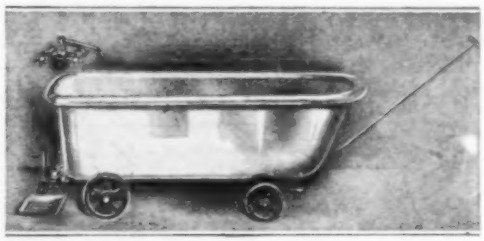


Each Airplane Owned by the Flying School is Housed in a Separate Hangar, like the One Above. A Single Fire will Thus Never Damage More Than One Plane

ordinary individual or aero corporation. One flying school, however, has evolved a substitute that is "just as good." For all of its planes it has built, around its airdrome, small individual hangars. Each is of frame construction, and has been built at minimum cost by making it just large enough to shelter the plane. The ground plan resembles that of an airplane, a narrow shed extending rearward to receive the fuselage and tail group.

BATHTUBS ROLLED ON WHEELS ABOUT HOSPITAL CORRIDORS

A bathtub on wheels is found decidedly convenient in the modern hospital. Filled in the bathroom, it is pulled to the pa-



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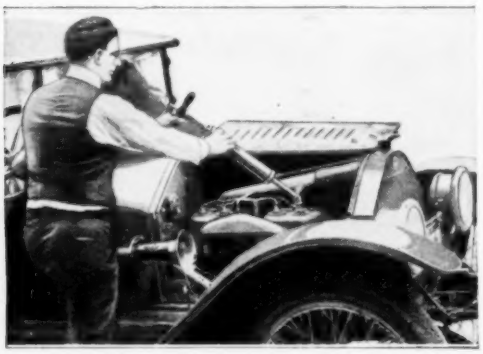
Having been Filled from the Swinging Spout, the Tub is Rolled down the Hospital Corridors to the Patient's Room. It is Later Emptied through the Special Drain

tient's room, sparing him needless exertion. In answer to the demand for these tubs, the most satisfactory equipment is now being produced. The standard tub, of the usual size and material, rolls smoothly on its rubber-tired wheels in response to a pull on the removable tongue.

SIMPLE CONTRIVANCE LOCATES AUTO-ENGINE TROUBLES

Various automobile-motor troubles can be located with a new testing device,



Automobile-Engine Testing Device in Operation: The Contrivance Locates Loose Pistons, Leaky Valves, and Other Troubles

which consists of a hand-operated air pump, provided with an outlet pipe that can be screwed into a spark-plug hole, and equipped with a dial pressure gauge. The latter is fastened to the handle of the contrivance, and connected with the hollow piston rod of the pump. Loose pistons and leaky intake or exhaust valves can be detected by adjusting the engine to different positions, and forcing air into the cylinders with the device. Compression can be investigated by cranking the motor and observing the gauge, which indicates the pressure in the cylinder.

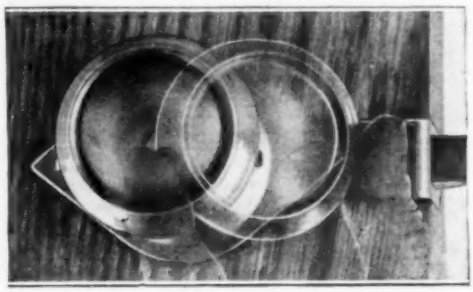
WARM-AIR CHAMBER PROVIDED AROUND UNFINISHED HOMES

Cold weather prevented the addition of concrete and brick faces to a number of frame dwellings, erected recently in a northern city for the employes of an automobile factory, until the construction company in charge of the work devised a means for surrounding the unfinished buildings with warm air. This was accomplished by using high board walls, made in sections, and designed to be put in position around a house in a few minutes. A canvas roof was placed over the space between the structure and the wall. Small stoves, installed in the chamber thus formed, furnished heat to prevent the material from freezing.

Around the Lower Portion of This House can be Seen the Warm-Air Chamber Which Prevents Building Material from Freezing

LATERAL MOVEMENT OF KNOB LOCKS DOOR

For the bolt, hook, or makeshift that has been used to fasten the bathroom door may now be substituted a tidy combination of knob and lock. The knob is of conventional appearance, and turns the bolt in the ordinary way. But to lock the door, it is carried an inch to the side, this motion being permitted by a slot in the plate. Once in this position, both knob and bolt are immovably fixed against



To Lock the Door from Within, the Knob is Simply Moved Laterally to the Second Position, Shown Transparently at the Right

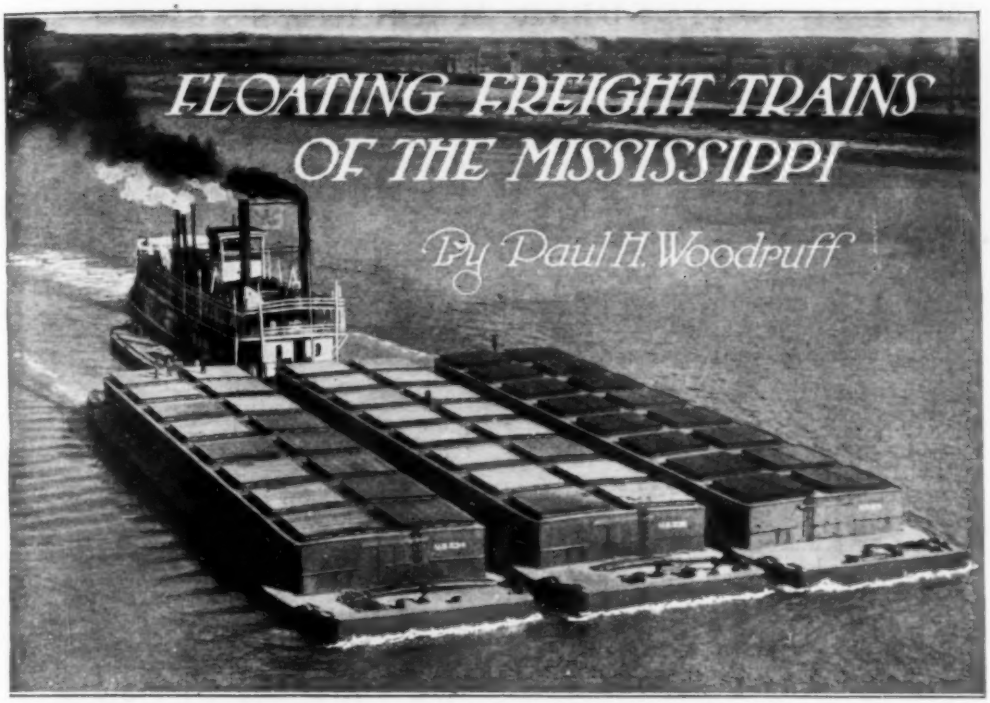
coercion by a jimmy. The lock does not interfere with the accustomed use of a key from the outside of the door.

MODERN HIGHWAYS PROJECTED FOR ISLAND OF OAHU

The Federal government is considering plans for the construction of modern roads on Oahu, one of the Hawaiian Islands, it became known recently, when a report on the subject was sent to the national capital. Some of the proposed highways would be used only for military purposes, while others would benefit the civilian population, as well as the army. It has been suggested that the expense of the project be shared by the government and the inhabitants of the island.

FLOATING FREIGHT TRAINS OF THE MISSISSIPPI

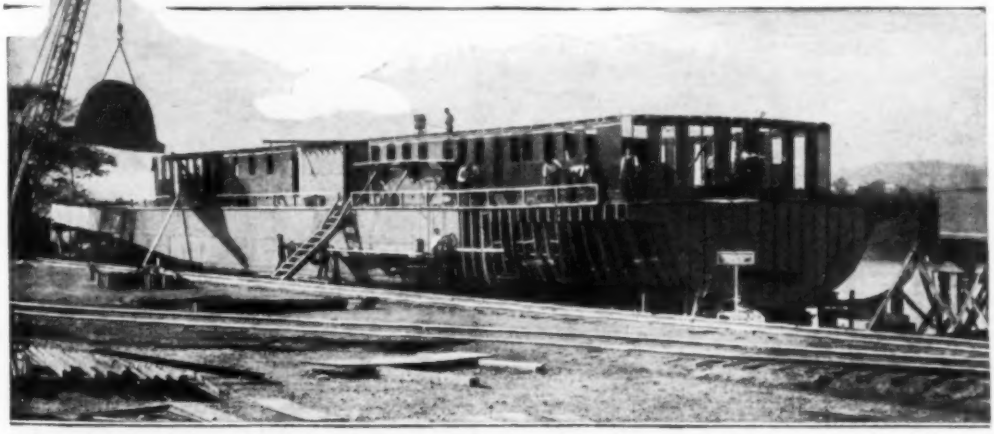
By Paul H. Woodruff



The First Business Trip of the New Steel Barges down the Mississippi from St. Louis to New Orleans, with a Load of Wheat: The Towboat Is One of the Old Style, and has Been in Government Service for a Year

ON a certain morning not long ago the greatest inland waterway in the world, after drowsing along for years through all the din that a busy group of river enthusiasts could make, awoke, like an aquatic Rip Van Winkle, to a sudden realization of modern conditions. The occasion for the quickening pulse that throbbed down the Mississippi that day was relatively small; merely the arrival, at the St. Louis docks, of two new steel barges. Big as they were, modern to the last engineering detail, and interesting in themselves, their real significance lay in the fact that they were the advanced guard of a fleet of 40 similar barges, and of six new, powerful towboats, the locomotives of these latest of floating freight trains.

This $6,290,000 flotilla is the government's convincing answer to the persistent prayers that have gone up for years out of the Mississippi Valley. It is the first official investment in floating stock in any way commensurate with the enor-



One of the New Towboats in Process of Completion at Point Pleasant, West Virginia, Whence It will Travel down the Ohio River to Its Duties on the Mississippi: It is Driven by Twin Screws Instead of Wheels

mous sums that have been, and are being, spent for improving the great track on which these mammoth trains will run—the big rivers of the Mississippi basin.

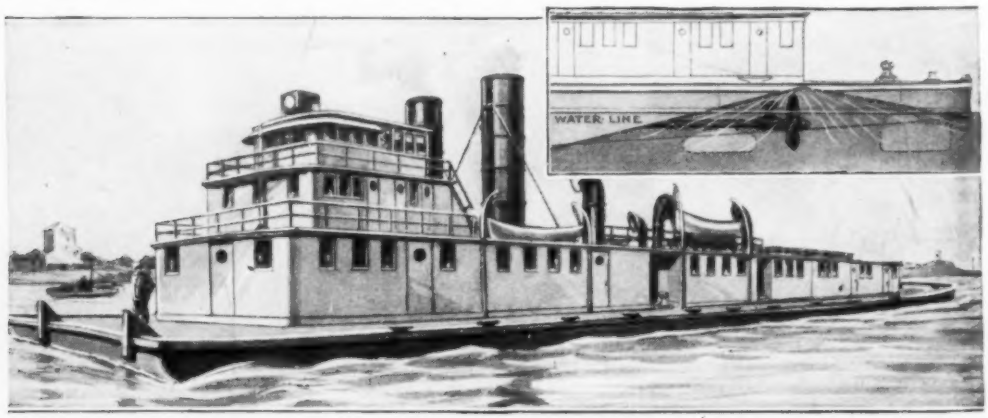
Delay has been encountered in the construction of the towboats, and some of the barges are making their early trips behind steamers of former days. The new water tractors are of the twin-screw type, driven by engines of 18,000 to 25,000 hp. The propellers operate in steel tunnels under the stern, and by an ingenious arrangement the screw, though it is seated so high that its upper blades are above water level, is always submerged. The siphon action of a higher part of the tunnel, over the propeller, accounts for this paradox.

If the term "floating freight trains" brings up the familiar image of a railroad box car or gondola, perhaps perched on a raft, the idea may be promptly dismissed. Each of these new all-steel barges holds 2,000 tons of freight—the equivalent of 20 to 100 cars. Each is 230 ft. long, 45 ft. in the beam, with a hold 10 ft. deep surmounted by a 9-ft. cargo box, giving a loading space 19 ft. deep, 184 ft. long, and 37 ft. wide. Transverse and wing bulkheads, the latter oil-tight, divide the hold into 18 compartments, and there are 16 hatches, 14 by 16 ft., and 16 double sliding doors, eight to a side. The scow-shaped hulls are designed to offer the least possible resistance to the water on the upstream tow, and their draft is small. Five of these barges and one towboat constitute a train, with a total capacity of 10,000 tons of freight. The schedule time for such a train from St. Louis to New Orleans is 4½ days, which is actually less than rail freight schedules.

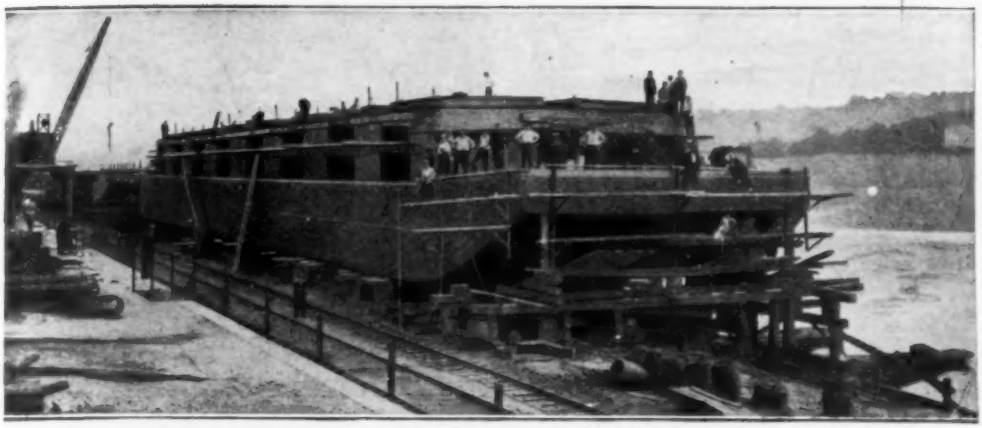
While all these preparations for an organized transportation on the lower river are in the making, the upper Mississippi has not been neglected. Up on the St. Croix River a steel barge even larger than those of the down-river fleet was launched—the nucleus of another flotilla of 24 freighters and four towboats, for trade between Minneapolis and St. Louis. These up-river barges are 300 ft. long and 48 ft. wide, with a capacity of 2,500 tons. They are made of ⅜-in. steel plate, weigh 500 tons empty, and draw 8 ft. loaded to capacity. Each has 20 compartments for oil, 250 tons of it in all, and a bin 250 ft. long, 38 ft. wide, and 6½ ft. deep, for coal and ore. They cost $150,000 apiece. Their towboats are the same length, 58 ft. wide, and weigh about 600 tons.

Friends of waterway transportation regard the advent of this scientifically designed equipment as the first opportunity inland water has had to compete with steel rails since the days of the early '70s, and feel that government control of railways has accomplished at least one good deed in reconciling the two forms of transport. With the making of joint rates for rail-and-water service, on the basis of 80 per cent of the all-rail charge, success of water shipping seems assured, and increased flexibility as well as capacity permanently bestowed upon the nation's most vital activity, transportation.

Antagonists of the waterway as a major carrier, however, point to the fact that the railroad administration has been operating freight barges on the Mississippi for more than a year, with their total receipts less than half their expenses, and with a relatively small saving to shippers. They argue that the cost of loading



The Finished Appearance of the New Towboats: They Have Engines of 18,000 to 25,000 Horsepower, and Propellers Operating in Tunnels under the Stern. The Insert Diagram Shows the Siphon Action of These Tunnels



Completing the First of the New Steel Barges Just before Launching It: The Eight Double Side Doors of the Cargo House, Visible above the Deck, are Duplicated on the Other Side. The Barge Is 230 Feet Long

and unloading and of transshipment will continue to absorb any advantage gained over the rails by the use of a natural track. Water-level cargoes must always be unloaded to a higher level by power, whereas freight cars can dump their loads from above. Barge-unloading machinery must be flexible enough to conform to varying heights of water. Unless the barges are always loaded to capacity, both going and coming, economical operation cannot be expected. Freight trains, with their cars constituting small cargo units, can be made up economically, where barge trains, of a few large units, are constantly confronted by difficulties of inflexibility in meeting the shifting conditions of commerce.

Though these criticisms embody some of the thought of skilled transportation engineers, it is obviously unfair to water traffic to demand that it meet, without opportunity for preparation, the dexterities developed by years of scientific competitive railroading. The waterway terminal question is a big one, but it is being met, not only by the government, but notably by the municipalities interested in waterway success. The fine adjustment of railway traffic may be credited largely to the employment of expert representatives spending their time in contact with shippers, a form of activity for which no parallel yet exists in the waterway business. And last, not enough publicity has been given to the advantages of water shipment. If barge trains go from St. Louis to New Orleans and back again with inadequate loads, it is because not enough shippers have been "sold" on the new order of things; not enough even are aware that there is a new order.

Perhaps it will take years to put the rivers in position to give railroad service to shippers, to pay reasonable returns on their investment, and to establish that 100-per-cent use of national facilities that must be demanded from now on. But that all of the obstacles to efficient operation will ultimately be overcome by native ingenuity and determination, cannot be seriously doubted.

THE LIGHTHOUSE

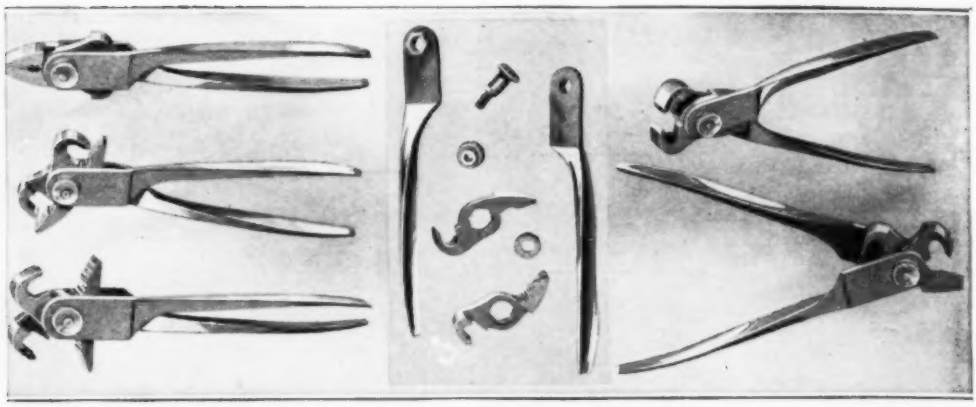
BY LYDIA M. D. O'NEIL

The slow sea croons as a tiger tamed
  Full-fed, inclined for play;
But we know his mood, when the black clouds brood
  And the lightnings leap to slay.
When wind and water combine for slaughter
  And torture the tossing ships,
Then the sea's wild whine is a cry malign
  From a loosened tiger's lips!

But however the winds of the world may roar,
  However the wild sea whines,
Warning the danger that haunts the shore,
  The lamp in the lighthouse shines!
Warning of danger, and promise of aid,
  And guide on a pathless way—
This is the pharos that men have made
  For the ships on the sea astray.

So the waves may purr, or the winds may blow
  From the south of the earth or north;
From Skerryvore to the Boston shore—
  Tree Point to the Firth of Forth.
Though Death rides high through the windy sky
  On the strength of the tempest's wings,
Hour on hour the lamp in the tower
  Burns on, and the fog bell rings.

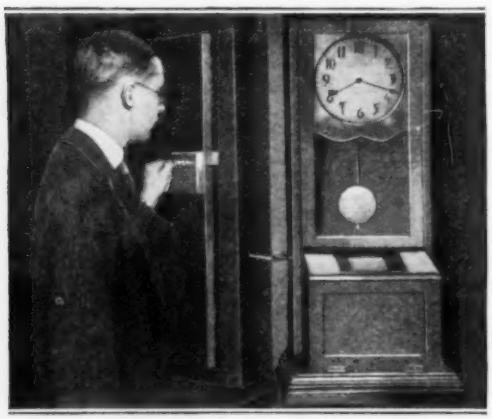
So it hath been since the ancient days
  When the priests of ancient fame
Kindled in Egypt a high red blaze
  For their fleets that homeward came.
Warning of danger, promise of aid,
  And guide on a pathless way—
This is the pharos that men have made
  For the ships on the sea astray!



By Different Assembling of the Seven Parts Shown in the Center, the Combination Tool is Made to Take These and Other Forms. At the Upper Left Is a Pair of Pliers, Then a Chain Wrench, and a Staple Puller. At the Right Are Pinchers and a Pipe Wrench. In Addition, One Handle Is a Screwdriver, the Other a Tack Puller

NEW ELECTRIC TIME RECORDER OPERATED BY DOOR LOCKS

Information regarding the opening of doors in shops, stores, or other places of business, is registered by a novel time recorder now on the market. Electricity operates the contrivance, while door locks serve as switches. Numbered keys are furnished for the locks, and when a certain door is unlocked, a card is printed by the machine to indicate the time of the operation, the number of the lock, the number of the key used, and on which side of the door the key was inserted. Eight locks, each one provided with eight keys, can be connected to the recorder. The device can be used as a time clock by manipulating a lever on the side of the mechanism case. In this way, the device is caused to print a time card, on which an employe can write his signature.



Door Locks Serve as Switches for This Electrical Time Recorder, Which can be Used as a Time Clock for Employes

SIMPLE COMBINATION TOOL ADJUSTABLE TO MANY USES

The happy thought of casting separately the jaws and arms of a pinching tool is responsible for the recent appearance on the hardware market of a little instrument that is quickly changed to 16 familiar forms, and is hence of decided value to motorists, farmers, and householders. Use is made of both ends of each jaw, one being formed as a corrugated pinching surface, the other as a transverse cutting edge. In addition, there is a pivotal and locking bolt with milled nut and a single washer. All of these parts are of drop-forged steel, tempered, and nickelplated. It is by their mutual adjustment, without the necessity, however, of screwing the nut completely off the bolt, that the mechanic obtains such tools as pliers, pinchers, pipe wrench, nail puller, and others.

AMMONIA BATH ADDS TO SPEED OF PHOTOGRAPHIC PLATES

Photographic dry plates made sensitive to all colors by mixing certain dyes with the emulsion, known commercially as panchromatic plates, are made more rapid, but shorter-lived, if the dye is treated with ammonia. Now it is found that the speeding-up effect may be obtained by subjecting the commercial plate to an ammonia bath before using it. Panchromatic plates soaked for four hours in a solution of three parts strong ammonia water, 25 parts ethyl alcohol, and 75 parts water, and then dried, showed the remarkable increase in speed of 100 per cent to white light, and as much as 400

per cent to the red. Without the alcohol, the increase was even greater, but the plates had to be used at once. Plates other than panchromatic were not so affected.

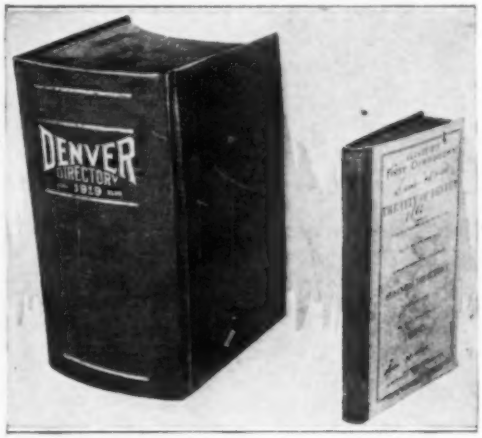
IMPROVED GIANT INCUBATOR COMPACT AND CONVENIENT

Holding 10,500 eggs, and hatching 3,500 each week, in a space 8½ ft. square, is the feat performed by an improved incubator with a growing record of success. Closed, the big hatching machine resembles a retailer's refrigerator, and is complete in itself. Opening the outer wood doors reveals inner doors of glass, for inspecting the eggs without exposure. The egg trays are compactly arranged, nine tiers high, at an angle, with three tiers of chick boxes under them.

Two large oil heaters are installed at the rear, and a partitioned cross chamber is lined with hot-water pipes, with electric fans at the top. The air is forced down around the pipes and up through the egg chambers, adjusted ventilators at the top keeping evaporation at a minimum. By a special arrangement, all the eggs can be turned in five minutes. Each week, as the eggs in the lower trays hatch, the remaining trays are lowered, and fresh charges inserted at the top, resulting in a continuous hatching process. A smaller model, of 2,440-egg capacity, is also made in similar form.

DIRECTORIES SHOW INCREASE IN SIZE OF WESTERN CITY

Denver's first and latest directories graphically illustrate how the population of the western city has increased during the last 53 years. The former was issued in 1866, and is a tiny volume, containing only 1,100 names, while the latter, printed in 1919, is a ponderous book, in which are listed 220,000 persons. An interesting fact is that the number of Smiths in the city last year was three times the entire population of the earlier date.

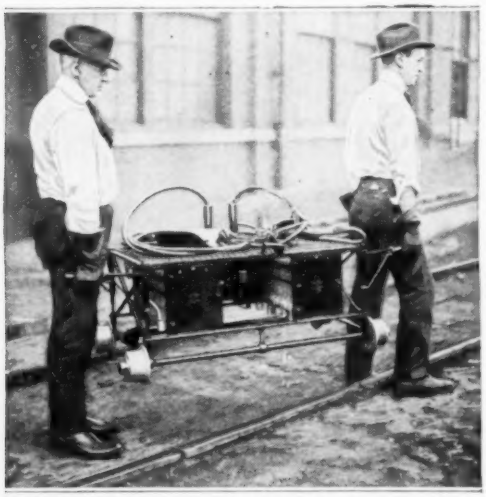


These Two Directories, Denver's First and Latest, Show How the Colorado City has Grown in 53 Years

Both the External Appearance and the Interior Arrangement of the Big Incubator are Revealed in This View, Which Shows the Inclined Egg Trays, the Chick Boxes Beneath, and the Heating Equipment. The Air is Forced Down around the Pipes and Up through the Egg Chambers by Electric Fans

PORTABLE RAIL-JOINT WELDER USES TROLLEY CURRENT

Current is taken directly from the trolley wire to operate a new portable arc welder for rail joints and similar jobs,



Portable Electric-Arc Welder: It Uses Direct Current from the Trolley through Resistance Grids, and Has Track Wheels and Folding Handles

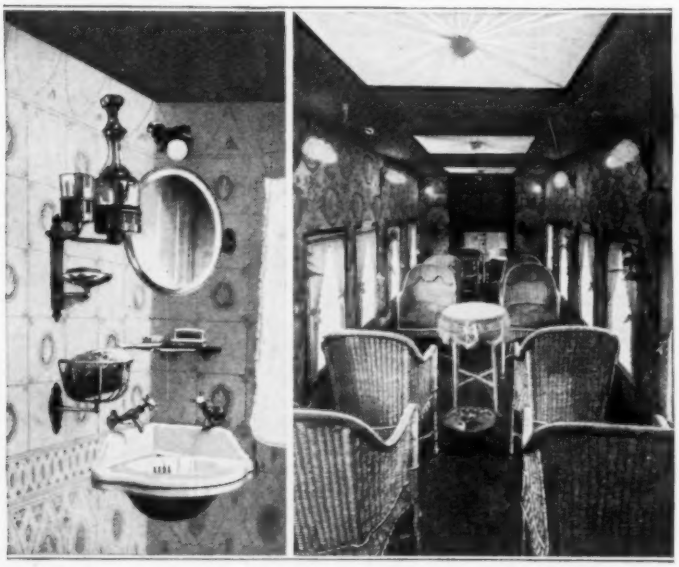
which has folding handles whereby two men can carry it easily. Using direct current, it cuts down the voltage by means of cast grids instead of a transformer. A circuit breaker is mounted between the grids, and conveniently located on the electrode handle is a switch for remote control. Small flanged wheels are provided for moving it on a track.

ELECTRIC GENERATOR PARTS NOW MADE OF CONCRETE

Adaptable as it has proved to a variety of strange uses, the application of concrete to the construction of electrical machinery seems rather far-fetched. Such use is actually indorsed, however, by a large builder of hydroelectric plants. The stator frame and thrust-bearing supports of vertical-shaft alternators may be built of concrete with considerable advantage and economy, and the method appears to lend itself equally well to similar applications on horizontal-shaft generators.

¶The popularity of Europe's inter-city airplane routes has set all the fashionable tailors of Paris to designing and creating feminine flying apparel. Sartorial exhibits will in consequence occupy considerable space at future aeronautical shows.

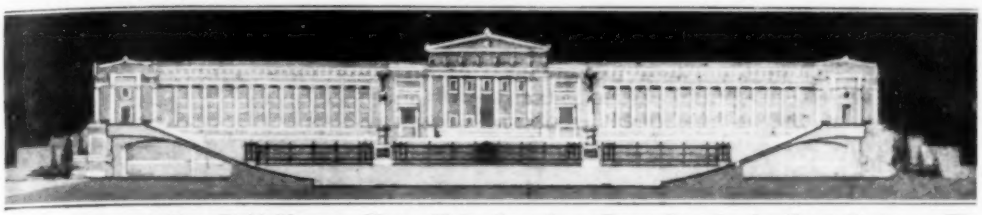
GREAT PASSENGER AIRPLANE IS RICHLY APPOINTED



The Dainty Salon at the Right Is the Cabin of a Great Passenger Biplane Exhibited at the Recent Air Show in Paris. In the Lavatory, a Corner of Which is Seen at the Left, the Passengers Find Every Convenience

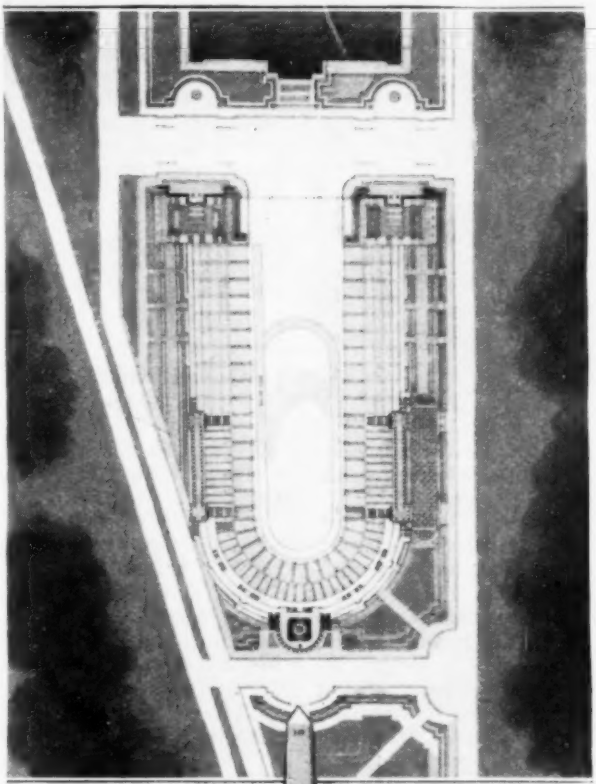
The cabin of every large passenger airplane exhibited at the recent French air show sounded the note of luxurious comfort, and none more so than the Caudron exhibit. The long fuselage interior of the big biplane resembles nothing so much as a spacious sun parlor. Light pours through 12 curtained windows and three skylights. The furnishings include eight wicker armchairs, a wicker table, cretonne wall coverings, electric bracket lights, flower vases between the windows, and a great mirror at one end to give the illusion of depth. At the opposite end is found a glistening lavatory with every appointment.

CHICAGO PLANS FOR LARGEST ATHLETIC STADIUM



Above Is View of New Field Museum That will be Seen from Every Seat in the Great Stadium. The Museum, Facing the Open North End of the Stadium, Is the Detached Plot at Top of the Plan Below

THE modern world's largest and perhaps most monumental stadium is to be erected on Chicago's down-town lake front in the near future, probably when prices again approach normal. Built in the form of a "U," to permit the ingress and egress of marching troops, the open, northern end will give every spectator a view of the new Field Museum of Natural History, already completed. At the other end of the arena, which itself measures 300 by 1,200 ft., will be concentrated 40,000 permanent seats. Another 20,000 will be built along the two northern arms, with space on the grassy terraces behind them for 30,000 more. This total of 90,000 exceeds the capacity of the Yale Bowl, now America's largest stadium, by 20,000 to 30,000. A great tower, based on a pillared portico, and with top reached by an elevator, will spring from the inclosed end. The entire structure, of concrete and marble, will cost at least $1,725,000; but with the con-



Plan of the Stadium: The North End, at the Top, is Left Open for the View and for Military Maneuvers, and 40,000 Seats are Concentrated at the South End

Front Elevation and Main Public Entrance to the Grand Stand: This Is the South End, Where Most of the Permanent Seats are Located, Nearest to the Athletic Field

templated addition of heroic statuary and ornament, the cost will run to more than double that amount. These new plans supplant the more costly proposal considered some months ago, and described in Popular Mechanics Magazine for August, 1919.

CONCRETE FRONT BEAUTIFIES FRAME RESIDENCE

Viewed from the street, a residence in a middle-western city appears to be an expensive concrete building, though in reality the structure is made almost entirely of wood, and was erected at a very moderate cost. This effect is obtained by means of an artistic concrete front and entrance, which add to the beauty of the dwelling, but represent only a small outlay of cash. The entrance resembles a pergola, and includes two massive square columns, while the front is designed to harmonize. A small window is located on each side of the doorway.

An Artistic Concrete Front and Entrance Added Much to the Attractivness of This Home without Greatly Increasing Its Cost

Side View of the Dwelling: In This Picture can be Seen the Frame Portion of the Structure, Which Is Scarcely Visible from the Street

INSTITUTE WILL MAKE BAKING INDUSTRY SCIENTIFIC

Hoping to put the bread-making industry on a scientific basis, the American Association of the Baking Industry has founded an Institute of Baking. The move is a radical one, as bread making has for centuries been a craft dependent on individual skill and knowledge of empirical formulas. Nevertheless, the association stands ready to abandon the old practices as scientific processes are devised. One large baking company, consuming annually more than 1,000,000 bbl. of flour, has in fact introduced scientific methods generally, with marked economies resulting. Reports of the new institute's experiments, carried on in conjunction with the National Research Council and with the aid of nutrition experts, agricultural specialists, chemists, and physicists, will be placed at the disposal of bakers throughout the country.

HOUSEHOLD ELECTRIC MOTOR MOUNTED ON TRIPOD

Power to operate small household machines is furnished by a new electric motor of unusual design. A metal tripod, equipped with rubber-tipped legs, supports the device, which is inclosed in a dust-proof case and provided with a carrying handle. One end of the shaft is fitted with a grooved direct-drive wheel, while the opposite end is geared to a graduated pulley. The contrivance can be attached to an ordinary lamp socket.

OHIO'S NEWEST STEEL MILL WHOLLY ELECTRICAL

With its equipment entirely electrical, a new steel mill upon which construction has started in Ohio will be the first of its kind in this country. It is to have two smelters, and 10 and 16-in. rolling mills, for producing fine qualities of automobile, locomotive, and cutlery steels, and will begin with a force of 500 men.

DUPLEX STREET LAMPS TO CUT COST OF CITY ILLUMINATION

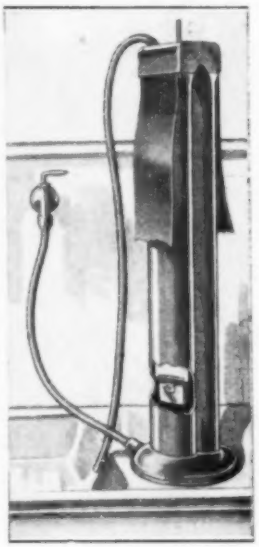
City administrations anxious to cut down running expenses will find much of interest in the proposal recently advanced by two illuminating engineers. A duplex electric street light is their suggestion, the globe to contain two lamps instead of one as at present. These lamps are to be placed tip to tip; one is to be of 600 to 1,000 cp., the other of 100 to 250 cp. From sundown until midnight, according to this scheme, the stronger lamp would burn. At midnight the city current would be momentarily reduced, causing a small mercury cut-out in each globe to extinguish the big lamp and turn on the smaller.

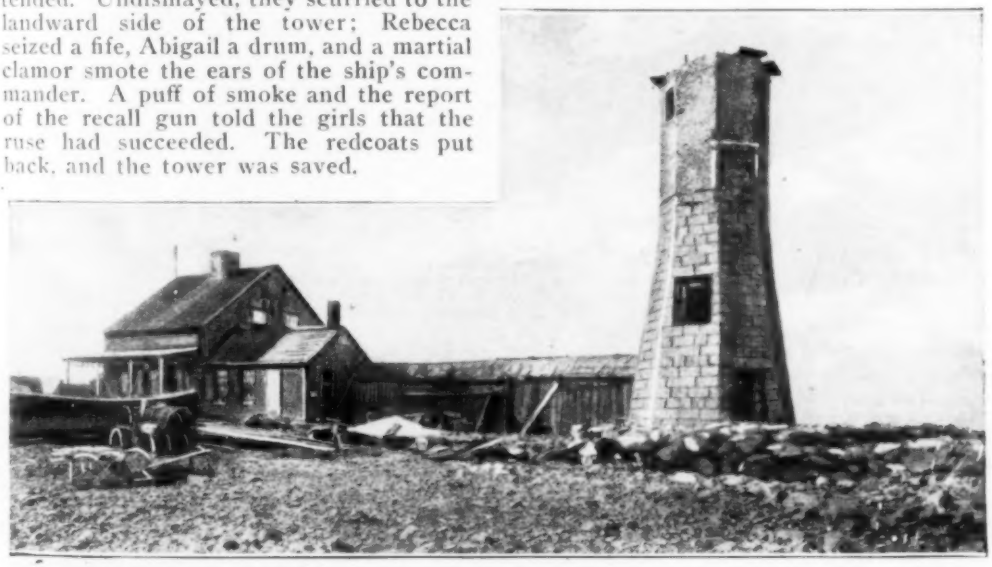
LEGENDARY LIGHTHOUSE STILL STANDS ON EASTERN COAST

Tradition hangs thick about the ruined lighthouse that stands at the entrance to Scituate Harbor, 20 miles southeast of Boston. In the anxious days of 1812, the legend runs, the light was tended by Simeon Bates, who lived with his daughters, Rebecca and Abigail. One day, during the father's absence, the girls were alarmed to see a British frigate slip into the little bay. As redcoats crowded into the small boats and put over the side, they realized that the destruction of the light was intended. Undismayed, they scurried to the landward side of the tower; Rebecca seized a fife, Abigail a drum, and a martial clamor smote the ears of the ship's commander. A puff of smoke and the report of the recall gun told the girls that the ruse had succeeded. The redcoats put back, and the tower was saved.

DEVELOP, FIX, AND WASH FILMS QUICKLY WITH TUBULAR BATH

Roll films are developed, fixed, and washed without a dark room by means of an interesting developing tank, just patented. It consists of one or more upright flat tubes, with a hollow base and a special cap. The film roll is placed in the top, held by springs, and a flat brass weight is attached to the end of the film. The paper backing is then drawn out through a light-tight opening, forcing the film down into the developer. Seven minutes later, the solution is emptied through an opening in the base, which is then connected by hose with a water tap. After two minutes' washing, "hypo" is substituted for 10 minutes, and further washing finishes the negatives. In multiple-tube tanks, each tube takes care of a film roll.



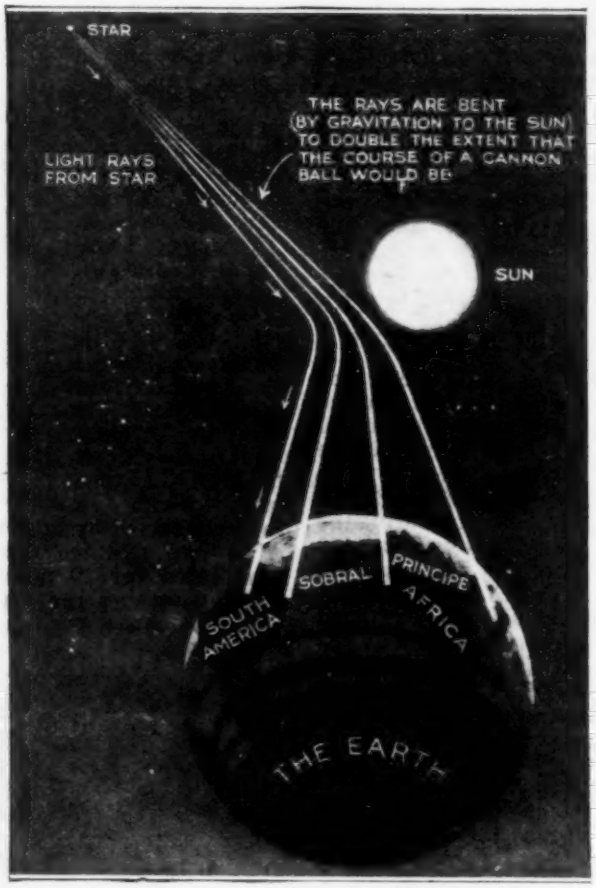


For Well over a Century This Little Lighthouse has Stood Guard over Scituate Harbor. It has Long Been Dark; but during the War of 1812 It Was the Scene of a Romantic Display of Quick-Witted Courage by Two American Girls

EINSTEIN'S THEORIES WILL REMAIN POPULAR MYSTERY

The epoch-marking report of the four British astronomers, mentioned in Popular Mechanics Magazine for January, has created in Albert Einstein's theories a popular interest that promises to go forever unsatisfied. The popular explanations in the daily press undoubtedly leave the mind more confounded than before. The root of the difficulty seems to be that Einstein has arrived at his conclusions by means of mathematical processes so intricate that few living men are qualified to analyze them. His ideas of special and general relativity, qualifying all our conventions of time, space, and motion, are unusually abstruse.

It is only the implications of Einstein's hypotheses as they affect our conceptions of natural phenomena that can be stated with any brevity. Thus his theory of the universe gives absolutely no place to the ether, conventional, all-pervading medium for the transmission of light and electromagnetic impulses. Even more revolutionary is his assertion, seemingly proved by the astronomers' report, that light rays are affected by the force of gravitation. This must be, for the lay mind, the kernel of Einstein's thought. The phenomena of gravitation and inertia lose their Newtonian isolation; they become intimately related to the phenomena of electricity, magnetism, and light. Einstein goes further; he claims that there is not a single physical or chemical reaction that does not feel in some degree the influence of this force. And his gravitation is not an instantaneous effect; rather it is a force that radiates with a speed roughly comparable with the speed of light.



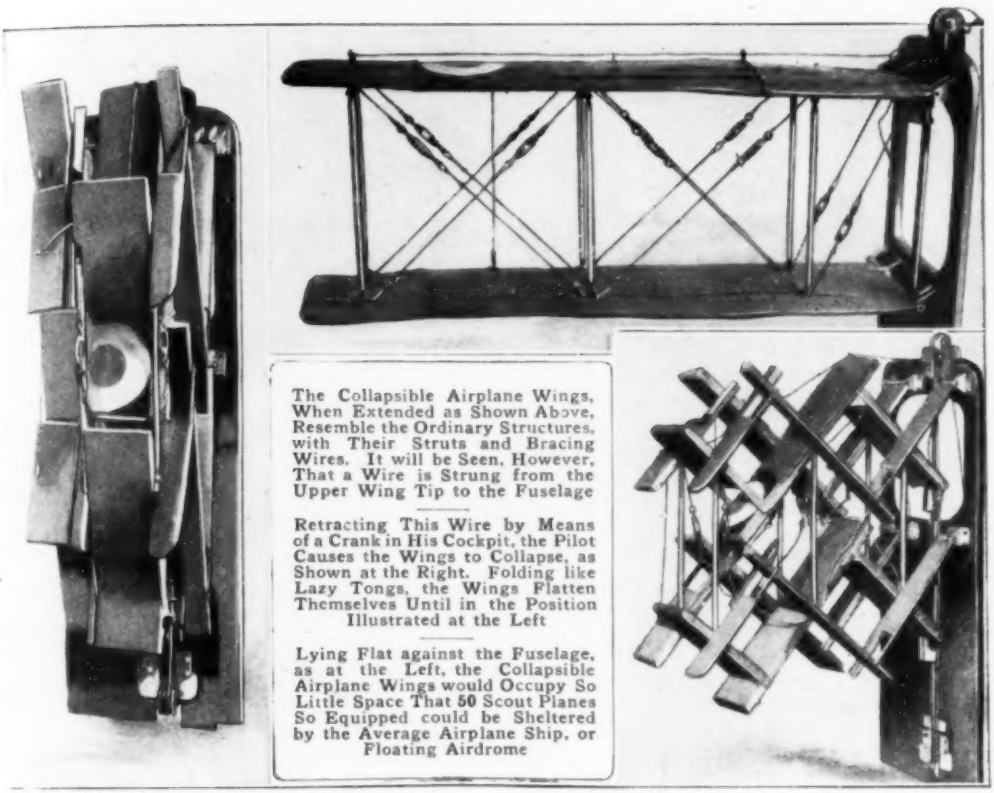
FROM SPHERE, LONDON; COPYRIGHT BY N. Y. HERALD

During the Eclipse of Last May, Four Astronomers Photographed the Stars around the Darkened Sun. Comparison with Normal Photographs Later Showed an Apparent Shifting of the Stars; Hence Seemed to Prove That Light is Affected by Gravitation, as Indicated in This Highly Exaggerated Drawing

For all practical purposes, however, Newton's venerable laws remain a sufficient approximation to the truth. Only in dealing with the highest velocities, rarely observable, for instance, the radiation of radium particles, will Newton give way to Einstein. The scientist in the commercial laboratory, the navigator on the sea, may safely leave Einstein's theories to those whose province is the dark frontier of science.

PHOTOS FINISHED IN RECORD TIME

High-speed photographic finishing, as a sequel to split-second exposure, was strikingly demonstrated by an Englishman at a recent lecture. After hurried development and wash, the negative was fixed in 30 seconds. Following a two-minute wash, the hypo was eliminated by dilute permanganate solution, the plate bathed two minutes in formalin and rinsed, and the lecturer's hot-air drying device turned upon it. Within 30 minutes after the exposure, a slide printed from it was projected upon the screen.



The Collapsible Airplane Wings, When Extended as Shown Above, Resemble the Ordinary Structures, with Their Struts and Bracing Wires. It will be Seen, However, That a Wire is Strung from the Upper Wing Tip to the Fuselage

Retracting This Wire by Means of a Crank in His Cockpit, the Pilot Causes the Wings to Collapse, as Shown at the Right. Folding like Lazy Tongs, the Wings Flatten Themselves Until in the Position Illustrated at the Left

Lying Flat against the Fuselage, as at the Left, the Collapsible Airplane Wings would Occupy So Little Space That 50 Scout Planes So Equipped could be Sheltered by the Average Airplane Ship, or Floating Airdrome

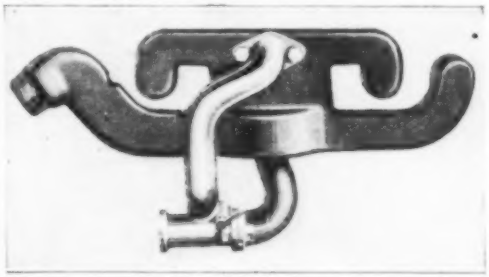
COPYRIGHT, KADEL & HERBERT

AIRPLANE WINGS FOLD UP LIKE LAZY TONGS

The naval airplane of the future will undoubtedly consist of a fuselage equipped with wings that collapse to permit easy storage in the hold of ship or supersubmarine. The development of the feature is still in the experimental stage, but favor is already inclining to rigid wings that are hinged at the fuselage. On an entirely different principle, however, is based a recent invention of this sort. The extension and retraction of the wings, as demonstrated with the inventor's model, are controlled by wires that run to a crank in the pilot's cockpit. To retract the wings he turns the crank; each wing (on the model) breaks into nine hinged pieces, and all come to rest folded snugly against the fuselage side. Such handling of the wings is, of course, impossible with the spar-and-rib structures now used; it is to be taken for granted that the inventor has another structural scheme, as construction of an experimental plane is said to be in progress at an airplane factory near Birmingham, England.

AUTO "HOT-SPOT" MANIFOLD HAS ADJUSTABLE BY-PASS

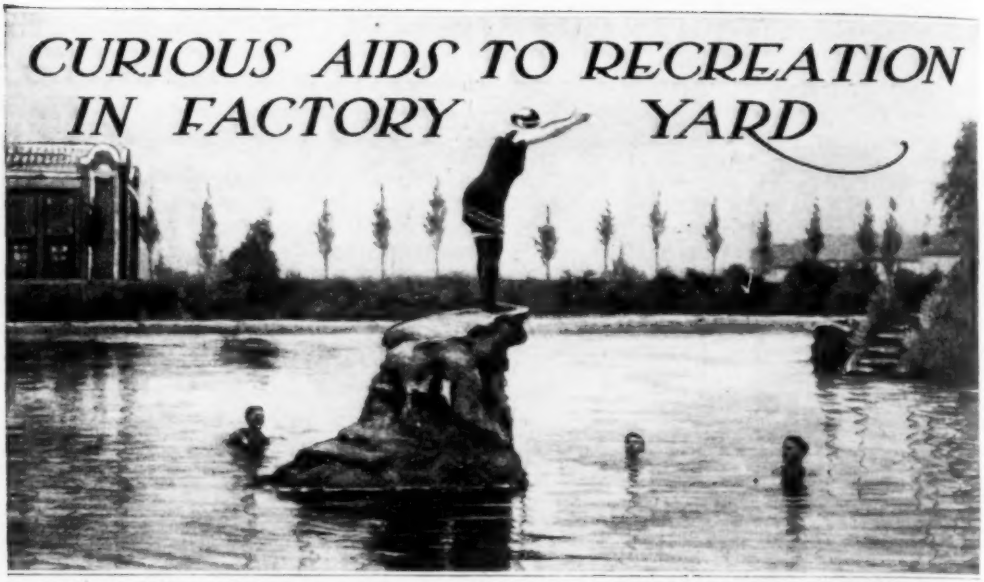
Taking the ground that an automobile "hot-spot" manifold may at times be too hot, and therefore should be adjustable, a Michigan manufacturer has provided a manifold with a cold by-pass. A valve operated from the dash shifts the gasoline intake from the carburetor to either the hot or the cold pipe, or divides the



Hot-Spot Manifold for Auto Engine, with By-Pass for Cold Air, and Adjusting Valve Especially Useful with Low-Grade Fuels

mixture between them, at the driver's will. This adjustment is found to be advantageous in the use of low-grade fuels.

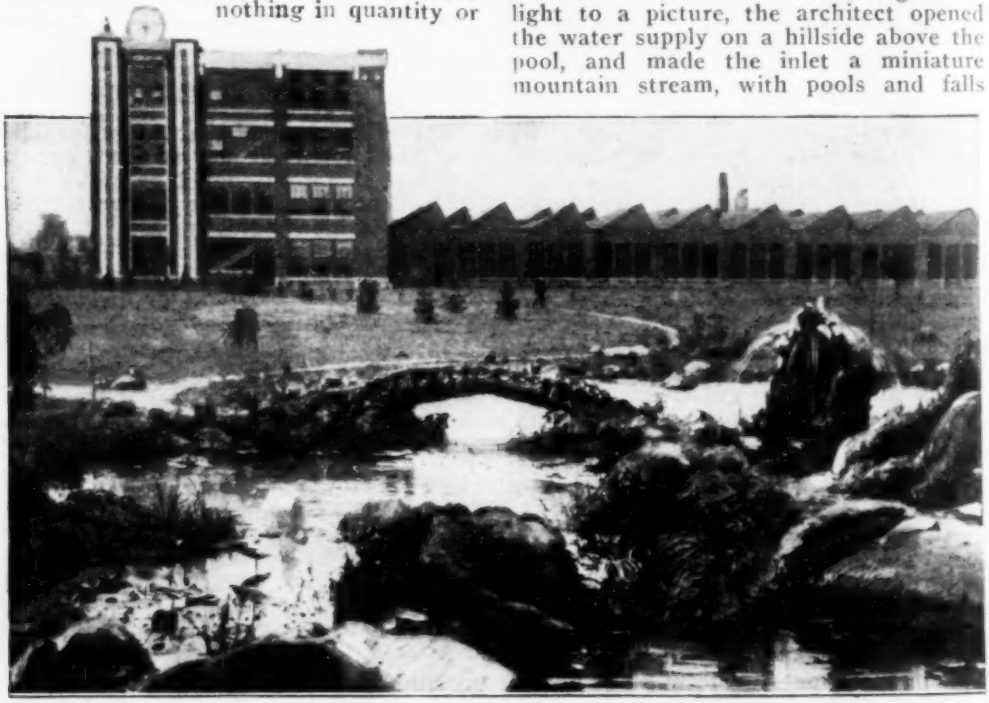
CURIOUS AIDS TO RECREATION IN FACTORY YARD



Swimming Pool Formed by Intercepting the Boiler-Feed Water of a Big Ohio Factory on Its Way from the City Mains, Giving the Employes Exercise and Recreation. Note the Curious Cement Diving Platform

BOILER water, very essence of the sordid and unromantic, was the original inspiration for a recently completed project as curious and fanciful as ever graced a large manufacturing plant. The idea was conceived when it occurred to the factory management that the feed water for its boiler room would lose nothing in quantity or quality if put to recreational use before it was turned to steam.

So a landscape architect was employed to lay out a pool that would serve at once as a neighborhood beauty spot and as a swimming and skating pond for the factory employes. Familiar with the little simulations of nature that give delight to a picture, the architect opened the water supply on a hillside above the pool, and made the inlet a miniature mountain stream, with pools and falls



The Inlet of the Pool Resembles a Little Mountain Stream, So Beautified by Grasses and Lilies and an Interesting Bridge of Rough Cement That the Factory Becomes the Most Incongruous Part of the Picture

fringed with grass and lilies. Quaint, rough bridges of rock and cement, and diving platforms in the pond of similar substance and quaintness, brought the work to the final stage: the building of a shelter house to warm the skaters in winter and to serve as a dressing room for the bathers in summer.

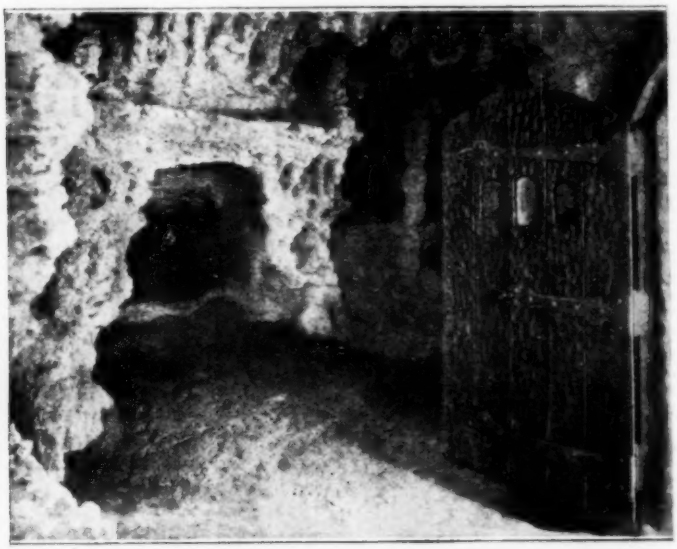
Seemingly ancient beyond the reckoning of man, eroded by centuries of water seepage, is the curious cavern that finally was offered to the employes as the clubhouse of their outdoor recreations. Yet this grotto of hoary image is as new as the rest of the work, and made of that commonplace material, cement. The process of artificial antiquing that created so bizarre an effect is itself new, to man if not to nature, and, like most effective things, almost absurdly simple.

The Almost Startling Effect of Age and Erosion Which Characterizes the New Cavern Is Observable in This Picture. The Seats Formed at the Column Bases Are Interesting

The secret lies in the use of mud for molds, the kind of mud that coheres in uncouth masses, and breaks apart in the roughest possible way. With great lumps of this substance, in timber frames, the molds were made for the

Grotesque and Unconventional in the Extreme, the Rough-Looking Shelter Is Undeniably Beautiful, and Really Represents an Entirely New Form of the Art of Building with Cement

columns and walls of the cave, building up a few feet, pouring the cement, and adding more mud. For the roof, a wood frame, covered with brush and straw, was piled with masses of the mud, full of pits and humps and rough holes. On this strange, formless form the cement was poured.

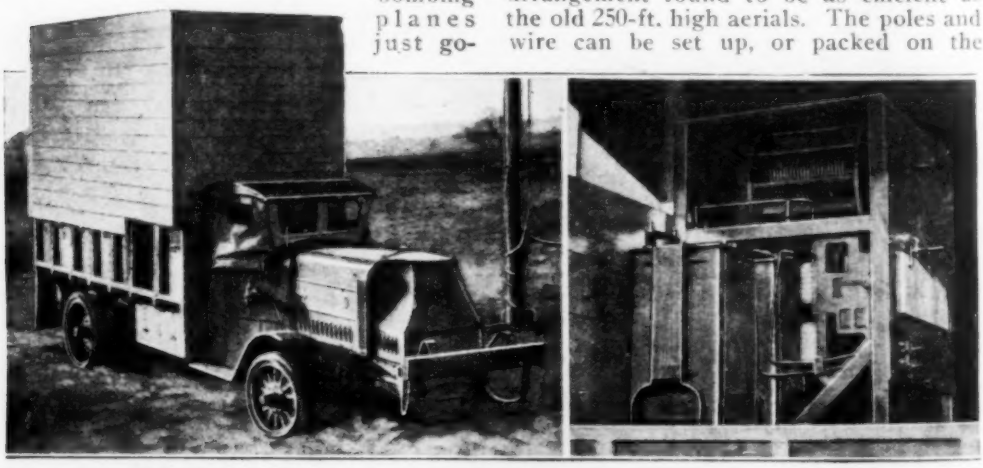


The Medieval Door of Heavy Timber, with Hand-Wrought Bronze Hinges, Harmonizes Well with the Antique Appearance of the Cave Itself

Ten days later the timbers were removed, the mud broken and washed away, and the new cavern revealed in all its grotesque beauty. Queer stalactites hung from its ceiling, queerer benches and goblin chairs protruded from its walls and columns, and at one side yawned a great fireplace. And here and there a few centuries more were added to its apparent burden of years by faint tints of yellow, green, and red, mixed into the cement. When flaming logs roar in the big grate, and strange shadows fall across the misshapen walls, the archaic picture is complete, even to the battered door of heavy timber with its hinges of hand-wrought bronze.

HUGE PORTABLE RADIO OUTFIT ON GIANT MOTOR TRUCK

A motorized wireless station, so huge that only the power of a 13-ton army truck gives it portability, has just been constructed at the eastern terminus of an aerial mail route. It is to be used for dispatching and controlling the big new bombing planes just going into the mail service. The station, powerful as many fixed sets, has a sending radius of several hundred miles, and its receiving range is practically unlimited. All of the equipment, of the most modern type, is included within the boxed-in body of the truck, except the antenna. This is of the coil type, 250 ft. in length and strung between two 20-ft. poles, an arrangement found to be as efficient as the old 250-ft. high aerials. The poles and wire can be set up, or packed on the



The Box Body of the Big Truck at the Left Is the Cabin of the New Wireless Station, and One of the Antenna Poles Is Visible in the Same View. Part of the Interior is Seen at the Right

truck, in a few minutes, ready for moving. The truck engine develops 250 hp., and runs the wireless generator as well as the wheels of the vehicle.

PLUNGER MEASURES ROAD WEAR TO THOUSANDTH OF AN INCH

For measuring the annual wear of concrete and similar road surfaces, the Federal Bureau of Public Roads has devised a micrometer which takes direct readings to one-thousandth of an inch. The instrument consists of two flat plates, each two inches in diameter, which are mounted on universal joints at either end of a bar, one foot long. The mid-portion of this bar bears a spirit level, and a vertical plunger whose motion is indicated by a graduated dial. The apparatus is used in conjunction with immovable brass plugs, which are set into a road surface at specified intervals. On the rounded road surface, the micrometer is plumbed by means of the spirit level; the plunger is lowered, and the reading is then taken from the graduated dial above.

To Measure the Wear of a Concrete Road, the Circular Plates are Placed upon the Surface; Then the Central Plunger is Dropped to a Permanent Brass Plug, and the Reading is Taken from the Dial

WINDMILL-DRIVEN DEODORIZER FOR ELECTRIC FAN

Attached to the guard of an ordinary electric fan, a recently invented device deodorizes the air at an extremely rapid rate. A small windmill on the contrivance is turned by the breeze created by the fan, and when in operation drives a pump, which forces air through the contents of a cylindrical deodorizing-liquid container. This fills the air with vapor from the liquid. A vent in the top of the deodorizer tank allows the saturated air to mingle with the current created by the fan.

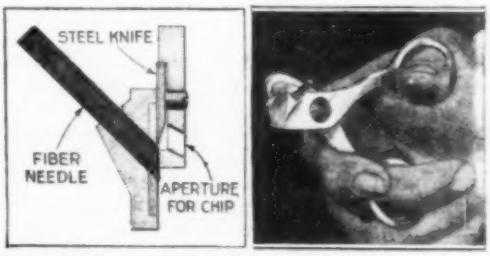
JOB-TIMING MACHINE CARDS FACTORY OPERATIONS

Production costs of any manufactured article can be determined only when the labor time of each factory operation is known. An electrically operated instrument, just brought out, records the time of starting and finishing each operation on a card, and stamps the serial number of the operation at the same time. Actuating the finger dial that carries the numbers, also automatically moves the card into place for the next record.

Machine That Times and Numbers Factory Operations on a Card, Shifting the Card Each Time

PHONOGRAPH-NEEDLE CUTTER MADE IN FORM OF SCISSORS

Owners of disk phonographs will be interested in the appearance on the market of a fiber-needle cutter of marked simplicity. Built in general like a pair of scissors, one blade contains the slot for the reception of the worn-out needle; the other contains a depression in which is set the cutting knife of tempered steel. This knife is held in place and adjusted by a single screw, so that a thick or thin shaving may be cut. With the knife set to cut the thinnest shaving, a needle may be used 40 times. With equal ease the knife may be removed for resharpening.



The Scissors at the Right Cut Fiber Phonograph Needles, as Shown. At the Left Is an Explanatory Cross Section, Showing the Knife, and a Needle in Place

FIRST AID TO A FREEZING RIVER

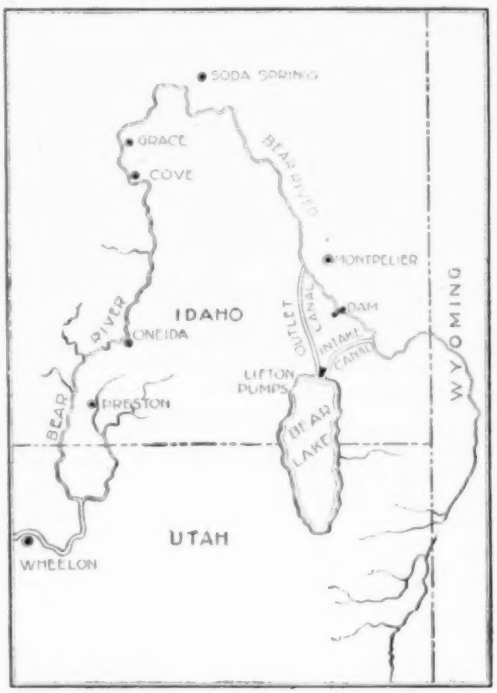
By J. CECIL ALTER

TWENTY-SEVEN hydroelectric plants under one management, supplying practically all the electric light and power used in and around Salt Lake City, Ogden, and northern Utah and southeastern Idaho generally, are dependent almost entirely on the daily stream flow from mountain sources for their turbines, only one plant having any reservoir or storage provision. These plants are widely separated over the district, being located principally near the cañon mouths, convenient to the major interests served in many cases, though an intercommunicating transmission system allows the distribution of electricity as needed, irrespective of its origin.

Of these power plants, 23 have water for capacity production from about March to early June, when the streams on which they are situated are running highest; but their production is greatly diminished during the droughty period of late summer and early autumn, and in winter when the feeder streams are closed by ice. Four large plants, having a capacity equal to about 70 per cent of the load ordinarily required of the entire family of plants, are located on Bear River, the largest stream within the great basin.

These "Big Four," situated at Grace, Cove, and Oneida, Ida., and Wheelon, Utah, have ample water for carrying the load assigned to them during the springtime, and nearly so during the greater part of the winter season; but the river becomes comatose with severe freezing weather, and would actually hibernate through the severest part of the winter were it not injected freely with water borrowed from beneath the ice on Bear Lake.

This lake, about 5 by 18 miles in size, has only a small outlet, and is not entirely fresh. Bear River passes within 10 miles to the northeast of the lake, and during its nearest course falls from a few feet above the average lake level to a few feet below. Thus by a dam in the river, the stream is diverted into the lake at high-water time. Later in the summer and autumn, the lake is then permitted to flow slowly by gravity through a canal into the lower Bear River, supplying the "Big Four." Approximately 400,000 acre-feet of water is thus doled out. In winter, when there is greatest need for sustaining the life of the stream, an additional 930,000 acre-feet becomes available through the same outlet by a battery of electrically driven pumps at Lifton, on the north end of the lake.



Map of Bear River Region, Showing Dam, Diversion Canals, and Pumps That Make Bear Lake a Great Reserve Basin

It is a 30-hour water journey, at best, from Lifton to the nearest plant at Grace, and more than twice as far to Wheelon; in winter, when mush ice, anchor ice forming on all protruding objects and on the shore lines, and usually a number of minor ice jams impede the flow, the water requires as much as 48 hours to make the journey to the turbines. Thus the weather conditions and the need for utilizing the plants must be calculated in advance with fair accuracy.

Ice jams of huge proportions are sometimes built up in very cold weather when the injected water, back of the slush and loose ice, carries the floe slowly down the cañons, and in order to hasten its progress, and lighten the expense, blasting powder is freely used at such times. Hydraulic pressure, however, is depended on almost solely to keep the stream flowing despite the action of the frost.

Thus it is on mild winter days, with

This Fire Occurred at Ekaterinen Haven, on the Murman Coast of the Arctic Ocean, Not Far from Archangel. The Barrels Contained Tar. The Officials in the Middle Evidently Preferred Posing for the Camera to Rolling Tar Barrels

hundreds of feeder streams softening and discharging sufficient water to awaken the mighty Bear from its slumber, and with ample water in sight for immediate purposes, the giant Bear Lake pumps at Lifton are speeded up on advice of an approaching cold wave, still a day or so distant, in order to sustain the life of the river no matter how severe the cold may become.

If the river freezes over, a flume is thus formed in the river bed, and the only requirement is to keep this flume discharging to capacity, and little difficulty is experienced. However, with alternating warm and cold, and wet and dry weather, this requires engineering skill of the highest order, particularly when submerged mush-ice jams choke the channel and break the ice. Therefore the "nurses" attending the "patient," that is, the corps of stream gaugers and pump men, and the "physicians in charge," that is, the superintendent of power and his dispatchers, are kept extremely busy in winter to prevent the collapse of the "patient," and maintain electricity for the homes, railways, mines, and manufacturers dependent upon its continuous supply for all their activities.

FIRE DESTROYS GREAT TAR DEPOT IN NORTH RUSSIA

Russia is a land of tremendous distances, tremendous resources, and at this time, of tremendous disorganization. And on the same scale was the recent conflagration, at Ekaterinen Haven on the Murman Coast, which destroyed thousands of barrels of Archangel tar, distilled from the pine forests of central and northern Russia. Officials in charge of the depot looked on helplessly as the ponderous smoke column rose miles into the air. Many barrels were rolled to safety, but the loss ran into millions of rubles.

TRANSLUCENT PICTURE SCREEN PERMITS DAYLIGHT MOVIES

By using highly translucent material for making a motion-picture screen, British inventors have achieved clear pictures in broad daylight, as well as in a brightly illuminated theater. The films are projected on one side of the screen while the audience views the other side. This feature will permit the use of pictures for educational purposes without darkening the classroom.

COMMUTERS FIND COKE MINE ON TROLLEY LINE

General Survey of the "Coke Mine," in Which Some of the Larger Specimens Are Visible

The Finer Coke, Mixed with Seaweed, Sand, and Shells, but Making Very Good Fuel

One of the Amateur Miners Who Discovered the Coke Mine, and is Working It So Hard That He Buys No Coal

By using shakings from the mechanical stokers at its power house as ballast, an interurban trolley line completely ruined a Connecticut beach that it traversed, the clinkers being washed into the sea with every high wind. About the time the line added insult to injury by raising its fare, a commuter dwelling near by discovered that the black ballast was about 30 per cent coke. The lumps, nicely cleaned by the waves, ranged from a little larger than a pinhead to the size of large-egg coal. Though the smaller grades were rather badly mixed with sand, seaweed, and shells, it proved no difficult task to separate the good fuel, and the mixture was found to burn even when half shells. The discoverer of this remarkable mine made up for the increased cost of car riding by getting through the winter without buying any coal, a few minutes with shovel and basket sufficing for the day's needs.

Inflating a Motor-Bus Tire: The Air Hose is Attached to One of the New Flexible Supports, Which Protects It from Damage by Holding It Upright

SUPPORT FOR AIR-DISPENSING HOSE HAS FLEXIBLE JOINT

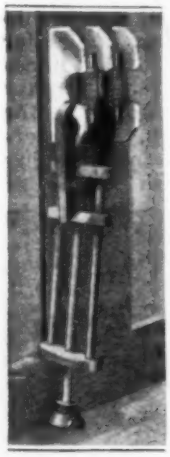
The air-dispensing hose of the modern public garage usually serves only a short time, due to the fact that it is damaged by automobiles, which frequently run over it, and is worn as a result of being dragged about by users. A contrivance now on the market is designed to protect the tube from these dangers, and at the same time to hold it in a convenient position. In this device, the supply pipe is supported above a rigid standard by means of a flexible joint, which consists of a spiral spring, inclosing a short length of hose. The spring holds the pipe upright when the dispensing hose is not in use, but when tires are being inflated, there is no obstacle to the free movement of the hose.

INTERESTING FACTS REVEALED BY STUDY OF RATTLESNAKE

Rattlesnakes do not use their rattles to sound warnings before striking, as generally believed, but employ them to terrify victims after striking, in the opinion of a certain well-informed naturalist. This conclusion was reached by the scientist after he had carefully observed one of the reptiles for a considerable length of time. In no instance did this specimen shake its rattles previous to striking the first time, though it almost invariably did so between two strikes, particularly when the second was delivered soon after the first.

Experiments were conducted to determine the rate at which the snake's tail vibrated to sound the rattles. Two different methods were used for this purpose, both involving the use of delicate electrical apparatus. One of the tests indicated that the reptile moved its tail backward and forward on the average of approximately 33 times per second, while the other disclosed an average of about 36 vibrations per second. The movement varied from 20 to 100 vibrations per second.

TONGS OF FIBER AND WOOD FOR REMOVING FUSES

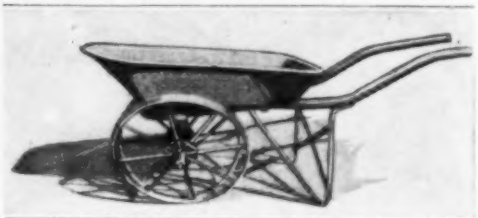


For the easy removal of cartridge fuses from electrical cut-out blocks, without danger of shock, a Connecticut inventor has designed a simple tool with a pair of fiber jaws that grip the fuse. A knob on the end of the wood handle rests in the palm of the hand, and a sliding shoulder, held by the fingers, draws the jaws against a wedge-shaped yoke that forces them together around the fuse, which is then extracted by a straight pull.

Pitchblende with a high content of uranium has been found in north central Ontario, Can. The government of the province offered $25,000 reward some time ago for the discovery of workable deposits of radium-bearing ores, and this is the second so far reported.

NEW BARROW HAS TWO WHEELS ACTING AS ONE

Greatly increased weight-carrying capacity and ease of operation are advantages claimed for a novel wheelbarrow,



Two-Wheeled Barrow, Designed to Carry Heavier Loads Than the Ordinary Device of Its Kind, and to be Easier to Operate

recently invented by a western man. Instead of being equipped with a single wheel, placed in front of the body in the customary manner, the new device is provided with two extra-large wheels, located underneath the tray, and cambered to such an extent that their rims nearly touch at a point directly under the bent axle on which they revolve. Practically all of the load is borne by the wheels.

TRENCH HELMET BECOMES PART OF WALL CLOCK

The discharged soldier's determination to find a household use for his trench hel-

Having No Sword to Beat into a Plow-share, the Ex-Soldier Turned His at the Right, into a Wall Clock, Straw Hat was Later Transformed with Equal Success

met has already borne fruit in flowerpots, washbowls, and lighting fixtures without number. The latest reported use is, however, the most ingenious. Painting numerals around the brim, and cutting several holes in the crown, the resourceful ex-soldier added clockwork, pendulum, and hands, and as a result displays a novel wall clock. A last-season's straw hat was later transformed in the same way, but with less difficulty, as the material was easier to work with.

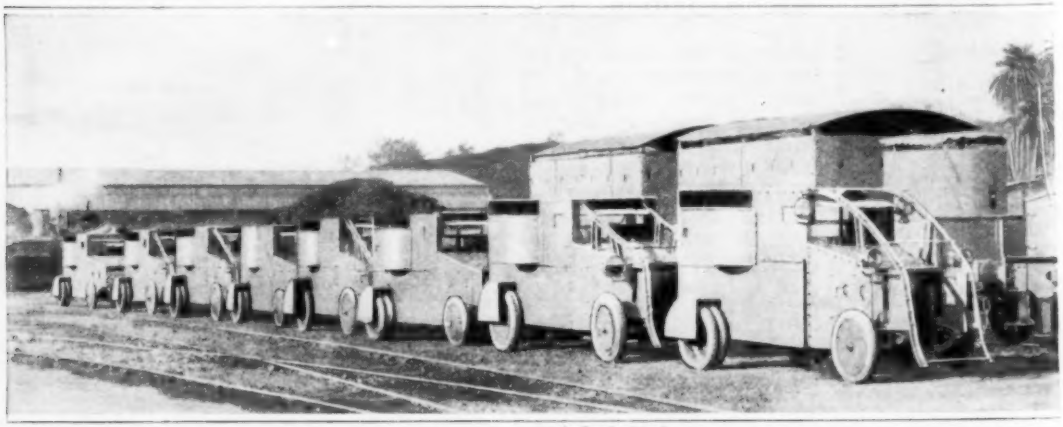
In This East Indian Carriage Shop More Than 500 Auto Chassis were Fitted with Box Bodies and Made into Supply Trucks for the British Armies Operating in Mesopotamia, Egypt, and Palestine

SOUTH AMERICAN INDUSTRIES BURNED INDIAN CORN

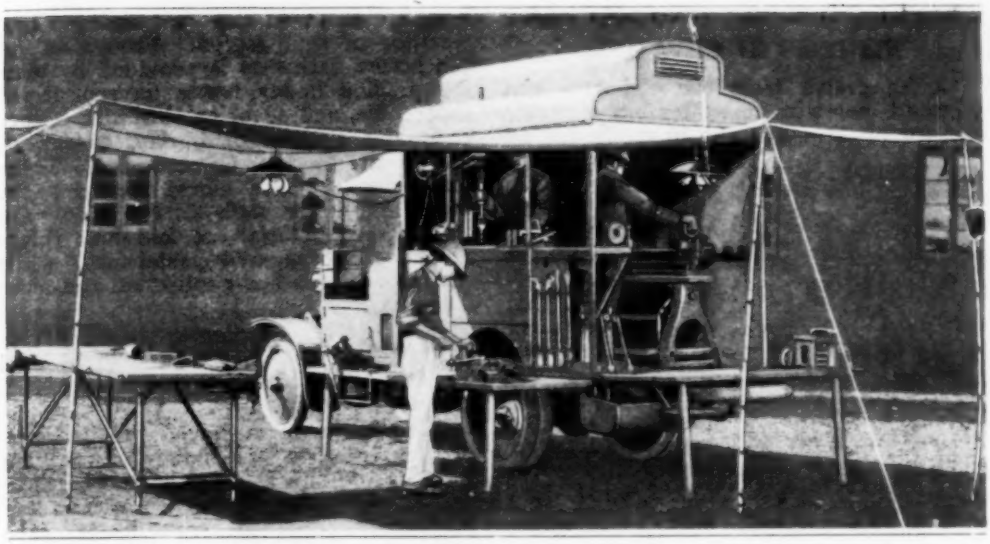
The railway and power companies of the Argentine Republic were forced by the exigencies of the world war to a notable fuel experiment. The ship shortage, which cut short her coal supply from England, resulted, too, in the accumulation of the vast tonnage of Indian corn, normally exported. The companies decided to burn the corn as fuel. Tests showed that in the ordinary fire box, with the fire bars placed ⅛ in. apart to prevent the grain from falling through, the corn burned freely and with the calorific value of hard wood.

SHOPS OF INDIA PRODUCE MOTOR CARS OF WAR

Of all the army motor cars used in the Mesopotamian campaign, and in Egypt and Palestine, a great share were contributed by a country popularly regarded as among the least producers—India. One 80-acre plant in the Bombay district turned more than 500 passenger cars into supply trucks by building box bodies for them, finishing 300 in one month. Locomotive repair shops north of Bombay produced a number of armored motor cars of highly efficient form. An interesting railway tractor, made by equipping a light American auto with a pair of

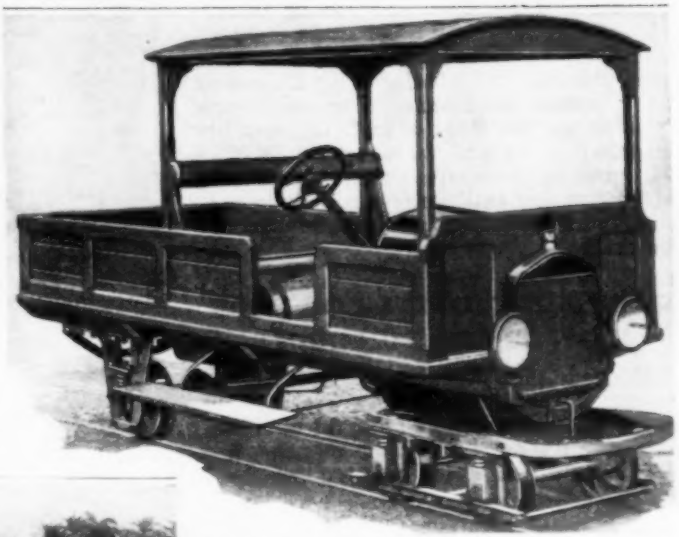


Autos and Trucks were Turned into Armored Motor Cars for the Army in a Locomotive Repair Shop Located a Few to the Needs of War When Its Services were Required, and Produced a Large Amount of

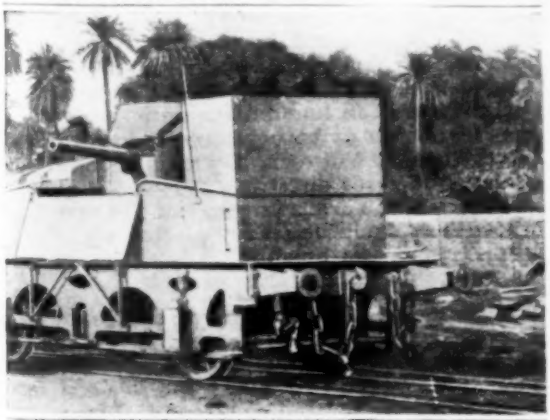


Motor Workshop with Awning to Protect Workers from Sun

flanged steel wheels in back and a four-wheel car truck in front, was another product. Most curious of all, perhaps, was a motorized workshop on a truck chassis, carrying lathe, drills, and grinder driven from the car engine, and furnished with wide awnings to protect the workers from the dangerous tropical sun. This useful vehicle was equipped to the last detail, and ready for any job.



A Curious Railway Auto Made in the Indian Shops by Adding Flanged Driving Wheels at the Rear, and a Regular Railroad-Car Truck in Front



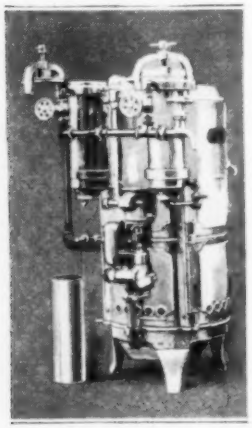
Miles North of Bombay, India, Which was Quickly Adapted Equipment for the British Army

FIVE HUNDRED PER SECOND IS NEW FILM-EXPOSURE RECORD

Motion-picture films exposed at the extraordinary rate of 500 pictures a second were recently made by French scientists, using specially designed apparatus with electric-spark illumination. Photographs of a bullet in flight plainly showed the cone of gas leaving the barrel. The new equipment, capable of recording any movement, is expected to be of great aid in the study of physiology.

COFFEE FORCED THROUGH FELT FILTERS IN NEW URN

Coffee drawn from the elaborate urn pictured herewith provides no grounds for complaint. For the grounds are all removed by a disk of heavy felt, which is placed on the bottom of a small cylinder in which the coffee is placed. This action is obtained by forcing the hot water, at 25-lb. pressure, into the top of the cylinder. Here it descends through the ground coffee, then through the filter, to emerge as an amber fluid absolutely free from solids. Two filter cylinders are provided so that they may be cleaned alternately with no interruption to the flow of coffee. Another interesting feature of the urn is that by turning a single valve, the supply of both water and gas is stopped, so that the generating process is thus entirely checked.



BEES SPEND WINTER ON ROOF OF OFFICE BUILDING

Housed in specially prepared hives, several swarms of bees are kept on the flat roof of a store building in a Michigan city during the winter months, and despite the exposed position of their homes, survive the extremely cold weather of that region. Protection for the honey gatherers is provided by placing a filled honey frame on top of the inner hive, and covering this with a flour sack and squares of burlap, carpet, or quilt, cut to the correct size. These pieces are pushed down between the outer and inner walls of the hive. On top of this material are laid four thicknesses of corrugated pasteboard, while two thicknesses are applied on the sides and ends.

Apiary on the Roof of a Store Building in a Michigan City: The Bees are Provided with Special Hives, Which Protect Them from the Cold

GOLFERS' "BOOBY" PRIZE MADE OF CAST-IRON PIPE

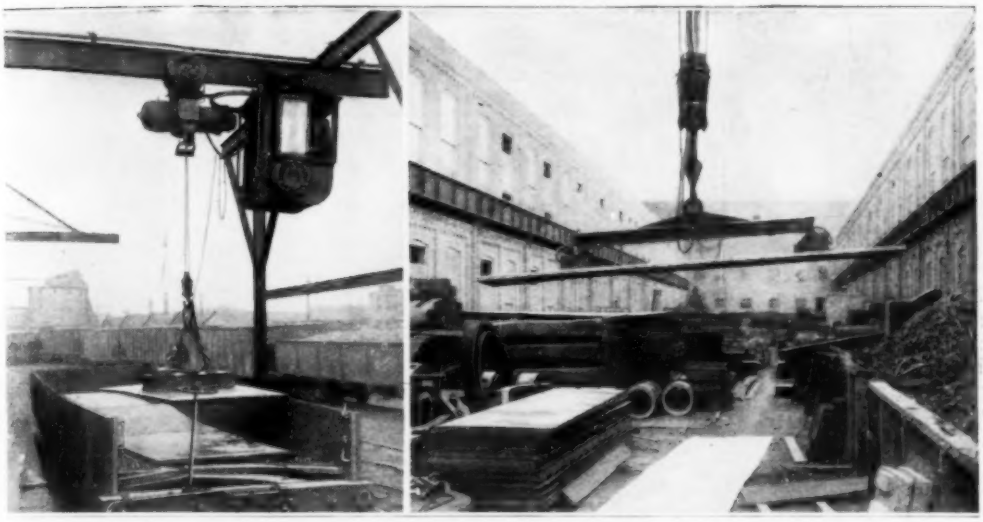
One of the most novel golf trophies ever awarded is the "booby" prize that went to the "low man" in a recent tournament. Like the first prize, it took the form of a loving cup; the material, however, is not silver, but cast iron. Short pipe lengths of many diameters were joined by a clever plumber until a laughable likeness was attained. The "engraved" inscription was cast with the body of the cup.

BY COURTESY OF THE VALVE WORLD

SURVEY DIAMOND-DRILL WORK WITH SOUND INSTRUMENTS

Use of the delicate sound-ranging instruments developed during the war, for checking up on the work of diamond drills in rock, is proposed by American engineers. The geophone, described in this magazine last July, and similar instruments have been found accurate in locating the source of boring sounds through hundreds of feet of rock. By taking sound readings in three directions at every hundred feet of the drill's progress, the course of the hole could be readily plotted without stopping the operation.

¶ Experimental installations of ball bearings on railway cars in Sweden have developed a bearing of this kind of a wholly new type. Test sets made for five-ton loads successfully handled loads of 20 tons per bearing, in trials equivalent to more than 30,000 miles.



Use of the Single Type of Rectangular Lifting Magnet is Seen in the Left-Hand View, While at the Right the Arrangement of Magnets in Pairs is Observed to Be Effective for Handling Long Pieces

EMPLOY RECTANGULAR MAGNETS FOR LIFTING METAL PLATES

Numerous industries now use rectangular lifting magnets, instead of the more common circular type, for handling certain steel and iron products, particularly thin plates of these materials. In a very efficient device of this description, the coil is inclosed in a boxlike steel case, the edge of which serves as one pole of the magnet. A projection in the center of the case forms the other pole. This contrivance can be employed singly, or in pairs. The latter arrangement is suitable when long pieces are being transferred. Fifty tons of 3/16-in. steel plates, 6 ft. wide and 7½ ft. long, were unloaded from a freight car in 50 minutes with one of the magnets.

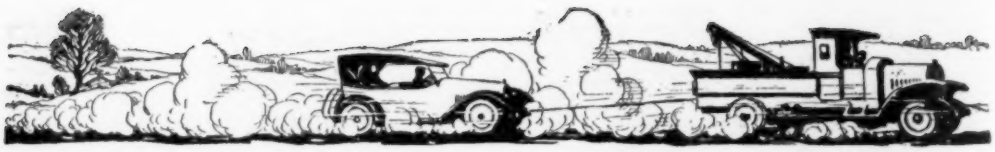
PLAN BIG PUBLIC AQUARIUM FOR CHICAGO PARK

Living fish from practically all parts of the world, including both fresh and salt-water specimens, will be exhibited in a mammoth public aquarium to be erected in Chicago, according to an announcement made recently in that city. The proposed building probably will be located in a park near the business district, and not far from the new Field Museum of Natural History, now nearing completion. Plans for the aquarium have not been revealed, but it has been reported that approximately $200,000 will be expended for the structure.

AUTOMATIC TELEGRAPH SENDER WORKS LIKE TYPEWRITER

A typewriter that sends telegraph messages is a fair description of a novel electrical mechanism whose commercial development has just been completed. The new transmitting machine has a keyboard of practically standard typewriter arrangement, except that capital letters are omitted. Operation of the keyboard makes a pattern from which the finished message is automatically transmitted by throwing a switch after the writing is satisfactorily completed. The machine has a capacity of 60 words to a pattern, indicated on a dial, but the message may be reiterated indefinitely by setting a repeating key. This feature commends it to wireless work, and permits the continuous sending of distress or other signals without attention.

Telegraph-Transmitting Machine: It Sends the Message, After It is Written, by the Throw of a Switch, the Dial Indicating the Number of Words



THE INGENUITIES OF THE AUTO THIEF

By Paul H. Woodruff

LEST the impression go abroad that auto thieving is a clever craft, it may be said at the outset that having one's car stolen ordinarily lacks the picturesque features which give relish to a common burglar story. In most cases the blame rests on the gross inefficiency of a mysterious watchman, whose aid the owner invokes with a cryptic phrase.

"If anyone touches it," he says, "somebody'll be sure to see him!" Then he turns his back, and the car disappears.

Less optimistic owners, of course, lock their cars. It is astonishing how many of them seem satisfied when that rite has been performed, and walk away leaving the key sticking in the lock. In Chicago's great public parking space in Grant Park, six or eight plain-clothes policemen gather a harvest of keys every day, to keep less scrupulous gleaners from taking key, auto, and all. But this is not going to be a statistical story. The key leavers and the nonlockers take all the interest out of the figures.

Nevertheless, plentiful as careless autoists are, the thief is bound, some time, to encounter a puzzling situation. To meet it, he carries miscellaneous keys, a metal saw, powerful nippers, and a supply of audacity. The latter probably explains why he is a thief; for his superabundance of it would get him into trouble in no time on any honest job. Only a short time ago a slender trickster, trying vainly to crank a car he had never seen before, appealed for help to a burly policeman, and drove away expressing his thanks just as the real owner came onto the scene. Another marauder, visiting in a small Michigan town last summer, called the local officer of the law and borrowed his keys to unlock a car that pleased his fancy.

Lately the professional taker of automobiles seems to have become a specialist, studying certain makes until he knows more about them than the most enthusiastic "gasoline-alley" habitué. Besides the tools already listed, his pockets contain a "magneto pencil," loose parts of a distributor or timer, and perhaps other fragments of machinery that the knowing autoists are wont to remove to "fool the robbers." Then, also, he takes a post-graduate course in locks. A lone worker in Chicago, following a car until he had learned its habits, copied the number of its lock and ordered a new key from the factory to fit it, thus obtaining the coveted prize at the cost of a little patience and 35 cents. If the police had not caught him, the owner with his burglar-proof lock would still be puzzling over the mystery.

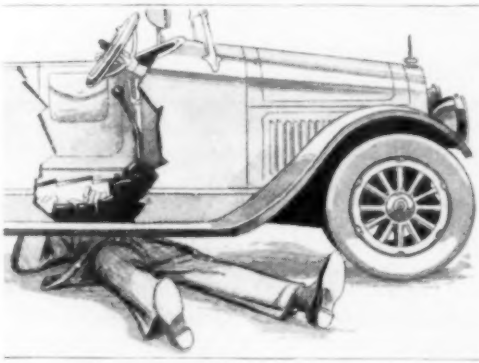
However, among astonished owners, high honors are held by the man whose car vanished entirely except for one wire wheel, which lay in the gutter, securely chained to a telephone pole. He had conceived the original idea of locking up his property by passing a chilled-steel chain around one tire and rim, overlooking the fact that wire wheels come in sets of five, with the spare temptingly accessible. The alert thief simply carried the car owner's mental process a step farther, and changed wheels.

Driving with the gear-shift lever locked in neutral seems impossible, yet it has been done. In some few cases, where the ends of the transmission shafts project from their housing, a man under the car can shift them to any position he desires, while his driver-confederate holds the clutch out. This means either starting in third, with the aid of a push, or running all the way in first or second. An enforced stop under such circumstances might prove rather awkward, but somehow such a contingency rarely seems to embarrass auto thieves.

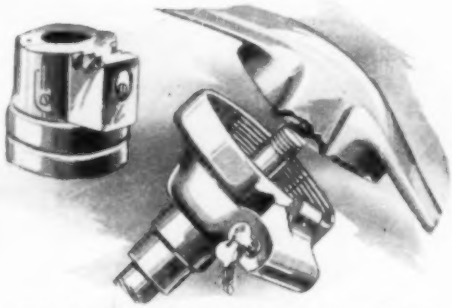
There is a law in some cities that parked cars must be movable, so they can be pushed out of the way in case of emergency, such as a fire. This somewhat narrows the variety of permissible locks. Where the requirement is not too strict, however, a curious form of shackle has gained some favor. It consists merely of a substantial lug of metal locked around tire and rim, which gives the car a noticeable bump every time the wheel turns over, and leaves a distinct trail along the pavement if anyone is reckless enough to drive it in that con-

The Auto Thief's Audacity Reaches High Altitude When He Asks a Burly Policeman to Crank Somebody's Car for Him

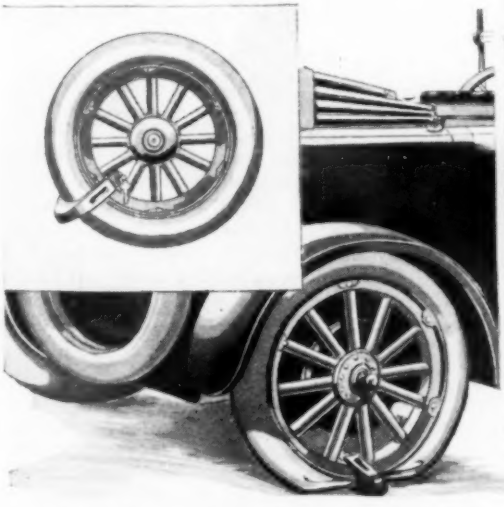
The Owner Chained One Wheel of His Car to a Pole, but Wire Wheels Come in Sets of Five, and the Thief Made Use of the Spare

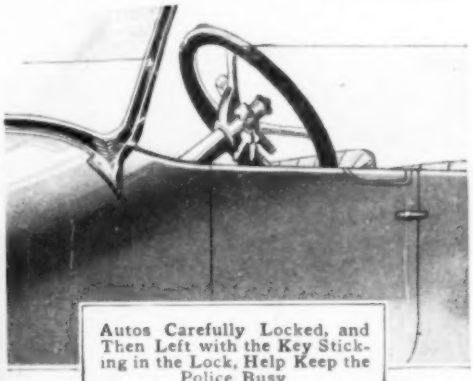


If the Ingenious Auto Stealer Finds That the Ends of the Transmission Shafts Stick Out of Their Case, Locking the Shift Lever does Not Bother Him



Steering-Wheel Locks Which have been Broken or Upset by a Few Heavy Hammer Blows, Delivered at Points Known to the Professionals





Autos Carefully Locked, and Then Left with the Key Sticking in the Lock, Help Keep the Police Busy

Locking a Lug around the Rim, as in the Insert, Failed to Stop One Robber, Who Deflated the Tire. At the Right Are a Magneto Pencil and a Distributor Part, Carried by Thieves

dition. In one city, added effectiveness is given the device by a standing reward of $100 for any driver caught bumping with it. But one case, at least, is reported wherein the resourceful thief deflated the tire, thus causing the obstruction to lie closer to the hollow of the rim, bandaged it up to look like an emergency repair, and got away.

Steering-post locks are highly popular with car owners, and deservedly so. The fault of some of them is that they may be broken or upset by a few heavy blows on the body of the lock. The well-equipped thief probably carries a short hammer for that purpose. But in one recent instance in Chicago, a piece of timber picked up in the garage and slammed down on the lock a few times served the dexterous crook as well as a fitted key. "Cannot be unlocked with a hammer" would be a valuable catch line for the auto-lock advertiser who could conscientiously use it.

When the ignition circuit or the feed pipe is locked, the professional auto stealer seldom fusses with it; he simply attaches a tow line and hauls the car away with another car or a truck. This method is decidedly common in the big cities, where towed cars attract little attention. It is true, however, that ignition locks which merely break a ground connection, or perform some such simple function, are rendered null and void without much waste of ingenuity, by shunting the lock with a bit of wire.

It is gratifying, after this cynical discussion of locks, to be able to say that a good many of them do successfully foil the villain, and to report one case where the latter was "hoist with his own petar," or, rather, with that of his victim. In this visitation of poetic justice, the culprit had gone as far as Raleigh, N. C., with a car stolen in New York. There a detective from the metropolis overtook him, handcuffed him, and chained the "bracelets" to the footrail in the tonneau of the car. After 24 hours of continuous driving over about 500 miles of muddy road, the competent member of the auto squad delivered an extremely weary and penitent sinner to justice.

SELF-CONTAINED OIL FURNACE FOR RIVETERS IS PORTABLE

For the fabrication of structural steel, for heat treatment and "shrinking-on" processes, and for general forge work, there is now available a small, efficient, and self-contained oil furnace. As the kerosene fuel is drawn from a tank below

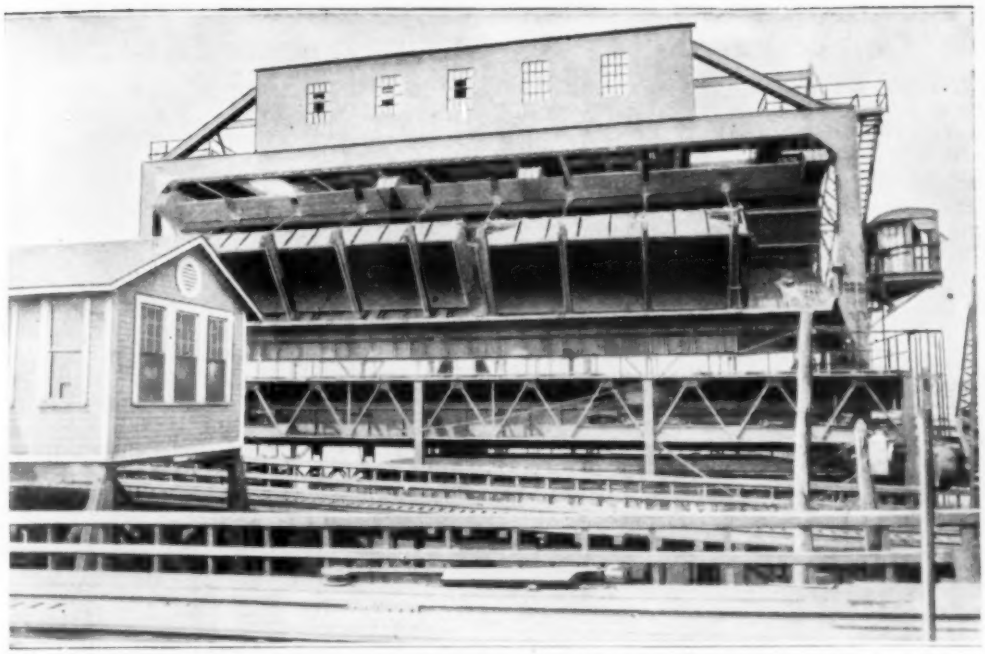
This Self-Contained Furnace Burns Kerosene, and Is So Light and Compact That It is Easily Carried about the Shop, Shipyard, or on a Girder

the furnace box, and as no outside fuel or air connections are made, the furnace can be moved by two men at any time, even when operating. Operation is cheap, too, as a temperature of 2,500 to 3,000° can be maintained during a 10-hour working day at a fuel cost of little over a dollar. The most obvious use for a furnace of this type is in multiple-story girder construction. The furnace is kept close to the riveters, and so delivers well-heated rivets without the necessity of dangerously long throws. Its portability makes its equally desirable for ship construction.

BIG ELECTRIC-LIGHT SYSTEM USES RADIO TELEPHONES

Telephone lines used for the control of electric-power transmission systems are born to trouble, mainly because of their high-voltage neighbors. A large service company operating in a central state has installed wireless telephones at two of its plants, 25 miles apart, as insurance against emergency. The radio has a range of 100 miles.

¶Six-month policies on hogs are a recognized form of insurance in Iowa, and quite popular among farmers. A veterinarian first examines the whole herd, and makes provision for regular inspection thereafter. On an average, one hog in every 16 dies of disease.



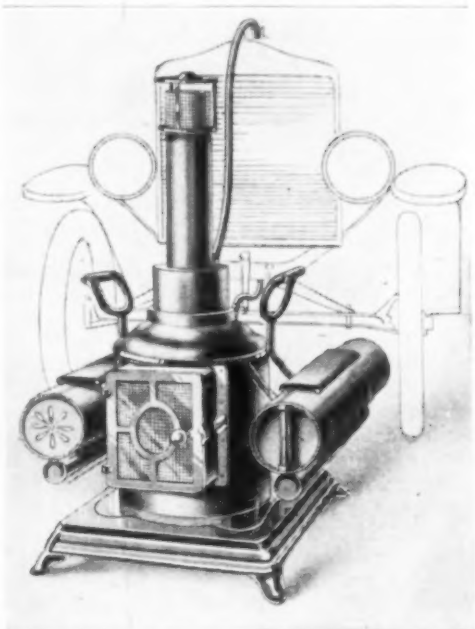
Designed to Unload 110-Ton Coal Cars, This Giant Dumper Is Capable of Emptying Two Ordinary Carriers at One Time. The Machine was Installed by a Railroad Company at an Eastern Seaport

HUGE COAL-CAR DUMPER BUILT FOR RAILROAD COMPANY

Two ordinary coal cars can be emptied simultaneously by a mammoth dumper, now in operation at an eastern seaport, where it was erected for a railroad to unload the enormous 110-ton carriers recently purchased by the company. Except for its great size, the machine is practically identical with smaller devices used for the same purpose. Eight self-adjusting clamps hold cars of different dimensions on a rotating platform, which is turned by powerful electric motors. The new cars are declared to be the largest ever constructed, each one weighing approximately 320,000 lb., when loaded to capacity.

KEROSENE HEATER PREVENTS FREEZING OF RADIATOR

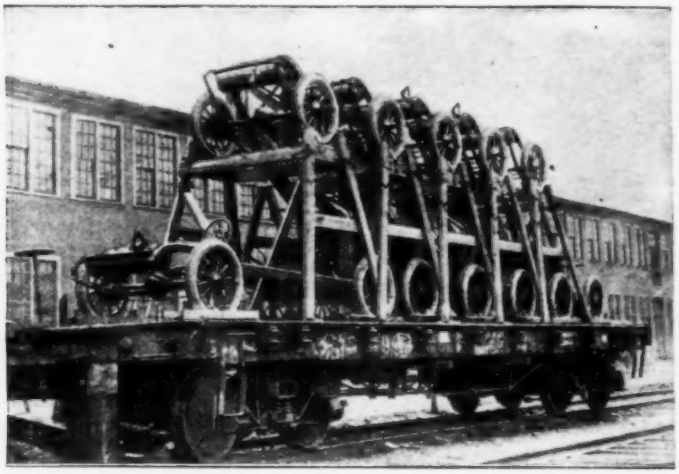
Half the difficulty of motoring in winter is removed when the private garage is equipped with a heater that keeps the radiator warm overnight. A new stove for the purpose burns kerosene, and maintains constant circulation of hot water. Rising from the reservoir, the heated water passes through a rubber hose to the radiator drain cock, permeates the radiator, and returns through a hose slipped into the filling port.



Water Heated in the Little Kerosene Stove Rises into the Radiator through the Hose Seen at the Right of the Chimney Base, Making a "Freeze-Up" Impossible

SIX AUTO CHASSIS SHIPPED ON ONE FLAT CAR

Freight-car shortage has interfered seriously of late with the ambitions of automobile makers to give quick deliveries. One western manufacturer got around the difficulty, however, by shipping six complete chassis on one flat car, arranging to have the bodies built at the eastern destination. Five of the chassis were supported in an inclined position, almost on end, on timber frames set on the car floor. The sixth was placed flat under the slope of the fifth, making a very compact arrangement.



Ingenious Method of Packing by Which Six Automobile Chassis were Shipped on One Flat Car: A Light Timber Frame Supported Them on End

PUBLIC-SCHOOL NATURE ROOMS CONTAIN MANY EXHIBITS

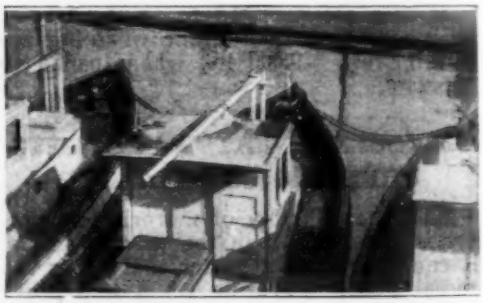
Children, attending the public schools in New York City, are able to study plant and animal life without visiting the country. This has been made possible by the establishment, in four of the educational institutions, of nature rooms, in which are displayed numerous botanical and zoölogical specimens, including fruits, seeds, wild and cultivated flowers, mounted birds, birds' nests, insects, and fish, besides other representative flora and fauna. Efforts are made to vary the exhibits according to the season of the year. For example, ripened farm products are shown in the fall; evergreens, in the winter, and budding twigs and frog spawn in the spring. The rooms are maintained particularly for pupils living in the more congested districts of the metropolis.

GAS MASKS PROTECT WORKMEN FROM AMMONIA FUMES

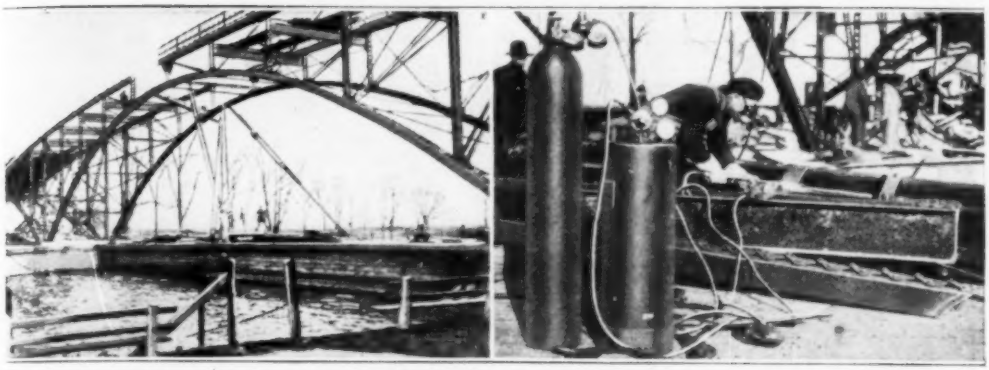
Gas masks for refrigeration-plant employes, who are exposed to danger in the form of ammonia fumes, have been devised by government experts. After experimenting with several materials, the inventors decided that pumice stone, saturated with copper sulphate, served most efficiently in the absorption canister of the contrivance, as this combination does not become heated, nor does it corrode an ordinary vessel, as is the case with sulphuric acid and pumice, used in some devices of this kind. One of the new appliances, supplied with 45 cu. in. of this substance, will protect a man for five hours in an atmosphere containing two per cent of ammonia, or for half that time in air holding five per cent of ammonia. The device is not likely to become clogged, according to the inventors.

FOLDING MAST ON MOTORBOAT SERVES IN EMERGENCY

Motor-driven fishing boats that operate on the west coast are not prevented from returning to port by engine trouble at sea. For employment in such emergencies, the vessels are equipped with folding masts, on which sails can be hoisted when the ordinary means of propulsion is out of commission. The mast is installed forward of the wheelhouse, and consists of a short spar, pivoted between two uprights.



Emergency Folding Masts: These Devices Make It Possible for Fishermen's Motorboats to Sail Back to Port When the Engines Fail



The Process of Demolishing a Curious Old Steel Bridge in a Chicago Park, Just Started as It Appears in the Left View, is being Completed in the Right Picture by Cutting Up the Steel with an Oxyacetylene Torch

CHICAGO PARK'S ODD BRIDGE FINALLY TORN DOWN

A most curious bridge spanning a lagoon in Lincoln Park, Chicago, has just been dismantled because it had become unsafe, after serving 26 years as a landmark of more than local fame. With a span of only 180 ft., its steel arch was 42 ft. above the water, to allow the passing of pleasure craft below it. A 99-ft. approach and a flight of stairs at each end aided in the ascent, of more than half its altitude, to the concrete-paved convexity of its center floor. After its height had inspired certain misguided persons to jump off, the newspapers nicknamed it "Suicide Bridge." Neglect and lack of paint finally reduced the structure to such a condition that repair would have cost a prohibitive sum. Meanwhile a better bridge had been built, and a good market for scrap steel decided the question.

MONTANA'S BIG ROAD PROGRAM CONSIDERS TRUCKS FIRST

With its vast stretches of unrailroaded farming land, Montana is an enthusiastic convert to the "ship-by-truck" idea. Such industries as dairying, for which the state is eminently suited, depend upon transportation for their success, and the only adequate transportation likely to be available in the immediate future would be truck trains and hard roads. Agricultural marketing rather than the convenience of tourists, appears to be the thought that actuated the recent voting of $11,000,000 for new roads, and this year another $15,000,000 is to be passed upon, to smooth the mountain trails for truck lines from the rural districts to the cities.

NEW FIBER MASK FOR WELDERS PROTECTS FACE AND EYES

Protection for the faces, as well as the eyes, of oxyacetylene and electric welders, is provided by a novel mask now on the market. The device is made from fireproof fiber, which is also a nonconductor of current, and is fitted with tinted-glass windows and a shaped nosepiece. Elastic bands hold the contrivance in place, one passing around, and the other over the head. The mask is pivoted at the point where the bands are joined, and can be swung down to cover the face, or pushed upward out of the way when not needed. One type, designed especially for electric welders, has an extension which covers the ears. Another is intended to be held before the face by means of a handle.

The New Fiber Welding Mask, Shown Ready for Action at the Left, and Raised Out of the Way at the Right, Protects the User's Whole Face

¶ Inaccessible western mountains, swept bare by forest fires, will be seeded by airplane, millions of seeds being thrown overboard in the hope of their finding fertile soil, if the suggestion of a western congressman is adopted.

NONSTOP DELIVERY OF AERIAL MAIL IS PROBABLE

The recent post-office purchase of six large airplanes fitted with trapdoors in the fuselage bottoms, makes more noteworthy the invention of a successful mail-pouch parachute. Designed to support sacks weighing about 125 lb., the apparatus, folded, weighs 10½ lb., and measures 13 in. long, 11 in. wide, and 3½ in. thick. A conception of the relative size is gained from the photograph. It was with the aid of this self-opening parachute that a crate of eggs was dropped, without breakage, from a postal airplane 800 ft. above the ground. Such parachute perfection will, of course, make possible the nonstop delivery of the most fragile parcel-post packages.

HIGH-SCHOOL STUDENTS BUILD ORE-PULVERIZING MACHINE

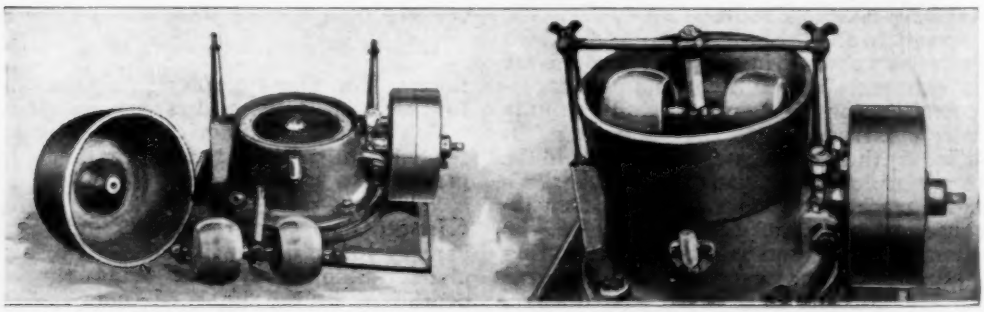
Students constructed an efficient power ore pulverizer that is being used in the mining and metallurgical laboratory of a Los Angeles technical high school. The machine comprises a revolving pan, 10 in. in diameter and 5 in. deep, in which are placed two heavy rollers, attached to the ends of a horizontal axle. Inclosed in the base of the contrivance are bevel gears for transmitting motion from a 6-in. pulley to the pan, which has an approximate speed of 60 r. p. m., when in operation. About one and one-half hours are required to reduce an average sample. Wet or dry material can be handled by the device, which is easily disassembled for cleaning.

DRAINAGE SYSTEM TO RECLAIM MISSOURI SWAMP LAND

A half-million acres, now covered with water, will be made available for farming purposes in southeastern Missouri by an extensive drainage system, comprising 650 miles of ditches and canals, which is expected to be in operation this year. Since work was begun on the project in 1912, approximately $4,000,000 has been spent for labor and materials. Parts of the principal ditch are 11 ft. deep and 175 ft. wide. The land was inundated in 1811, when an earthquake transformed the theretofore hilly region into a vast swamp.

PISTONS HANDLED QUICKLY IN NEW BENCH VISE

For the garage workbench has been developed a vise that will hold any piston from 2⅞ to 6 in. in diameter. To handle the first of a set, the mechanic slips the connecting rod through the central slot, then moves the jaw at the right into contact, and locks it with a turn of the cap screw. To remove the repaired piston and permit the insertion of another, he throws the clamp handle at the left. Both right and left jaws are faced with heavy leather.



Ore Pulverizer Made by High-School Students: The Revolving Pan, Gear-Box Base, and Pair of Rollers are Seen Dismantled at the Left, the Right View Presenting the Assembled Machine

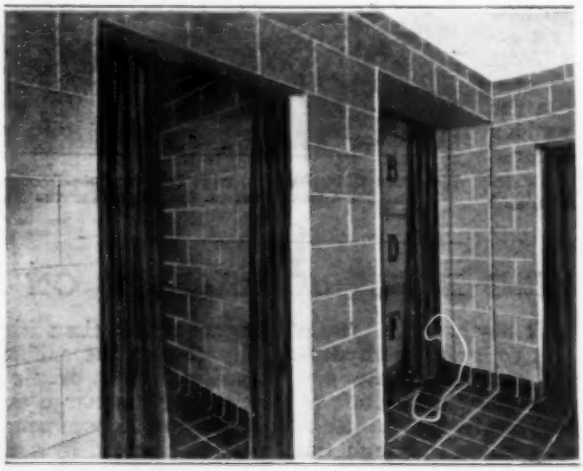
The Chaste but Comfortable Appointments of the Large Service Room of a Crematory in Kansas City, Missouri, and a Glimpse of the Private Family Room with Its Grotto Beyond

AN ULTRA-MODERN CREMATORY IN A WESTERN CITY

By ALLEN P. CHILD

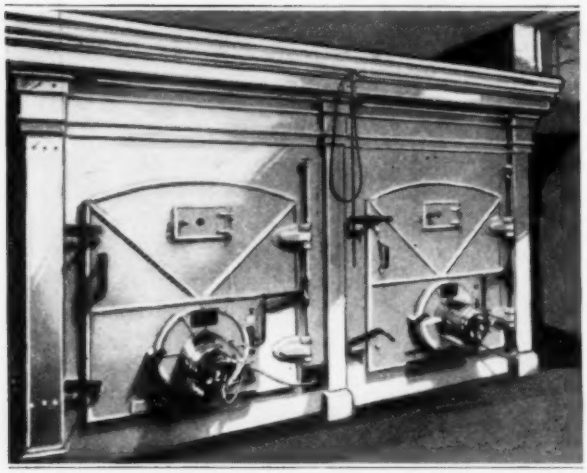
FROM time immemorial man has cremated the bodies of his dead. Although never a universal custom, this method of disposing of the corpses has been practiced in many countries and in various manners through different eras of civilization. The ancient Greeks generally cremated their dead and preserved, in splendidly carved and decorated urns, the ashes; only a law existed forbidding the cremating of bodies of persons who had committed suicide, unteethed children, and persons struck by lightning.

In modern times the practice has gained ground for reasons of sanitation and the encroachment of burial places upon the residences of living men. In Kansas City, Mo., the very latest facilities for cremation and storing of urns are offered in a new undertaking establishment.



The Receiving-Vault Entrance Is Far from Funereal. Its Walls Are Ivory, Its Floors Red Tile, and the Doorways are Hung with Curtains of Plush of a Rich, Dark Red

Upon entering the building one would hardly think he was in a funeral establishment. Ivory-toned walls with a red-tiled floor give a decidedly soothing effect. Wicker furniture, also in ivory color, with oriental rugs, afford a homelike atmosphere. A large service room furnished in the same style as the entrance hall cares for those attending the cremation. A small room at one side is for the private use of the relatives of the deceased, and on another



The Modern System of Retorts, Using Oil Burners of the Latest Design

side is a small music room for the accommodation of a simple orchestra or a soloist. Hangings of dark-red plush add a touch of dignity to the openings into the various rooms.

Three rooms, called "columbaria," are provided for the storing of urns. Fountain grottoes in both the main columbarium and the private-family room give an atmosphere far from funereal. Water is continuously running in the grottoes, and playing around the many-colored stones are hundreds of goldfish. Glass cases are built into the wall of the room, much as book shelves are made a part of the modern library, and here the simple but dignified urns are stored for the contemplation of relatives and friends.

¶Two Egyptian tombs, erected about the year 2650 B. C., and therefore some 4,570 years old, have been acquired by the Field Museum in Chicago and will be ready for exhibition by May. The larger one measures 36 by 16 ft., and its 3-ft. walls contain 222 blocks of stone, while the other is 20 by 12 ft. with a wall thickness of about 30 in. Each structure has several chambers.

The Main Columbarium, with Its Fountain-Decorated Grotto on the Left, and Its Glass Cases on the Right, for the Storing of the Urns

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PREVENTING ELECTRIC CHARGES ON AIRSHIPS

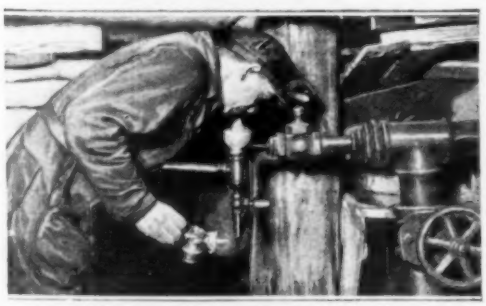
A very small spark discharge of static electricity is sufficient to ignite the hydrogen gas commonly used to inflate airships, and it is possible for such craft to become charged in several ways. Rubber-impregnated silk rushed through the air at high speed accumulates a positive charge, while cotton similarly treated becomes negative, the charge increasing at enormous ratio to the speed. At as low as 40 miles an hour the charge may gain rapidly if smoke or fog is present, the phenomenon being regarded as one of impact rather than friction. Rush of gas may charge the rubber valve seat to the sparking point, or the whole body of the ship may discharge to earth on landing. It is now recommended that the valve seat be shunted by a well-connected wire, and the landing rope and other cordage, as well as the entire surface of the fabric, be made conducting to a moderate degree. Sharp metal points on top of the craft form a safeguard against possible discharge to or from a passing cloud, dissipating the accumulated potential.

SATISFACTORY DIET ANALYZED BY BIOCHEMICAL METHOD

A satisfactory diet, according to a biological chemist who has just completed a study of the subject, consists of carbohydrates (sugars and starches), fats, proteins, mineral food or ash, and the two food hormones, "vitamines fat-soluble A and water-soluble B." A hormone is a substance formed in one organ for the benefit of another, to which it is carried by the circulation. Milk, eggs, and leafy vegetables, because of their content of "fat-soluble A" and their high protein value, protect the health if used in adequate quantities. Absence of "water-soluble B" causes such diseases as beri-beri, examples of which appear when the diet consists of rice or other grain robbed of its outer portion. A satisfactory diet cannot be arranged without some of the "protective" foods named.

DRINKING FOUNTAINS SUPPLY MINERS WITH PURE WATER

Installed at frequent intervals in the subterranean passageways of certain eastern iron mines are sanitary drinking fountains, which supply workmen with pure water. The devices are very popular with the underground laborers. In some cases, the fountains are located 500 ft. below the surface of the earth.



Drinking from a Sanitary Fountain, Located 500 Feet below the Surface of the Earth in an Eastern Iron Mine

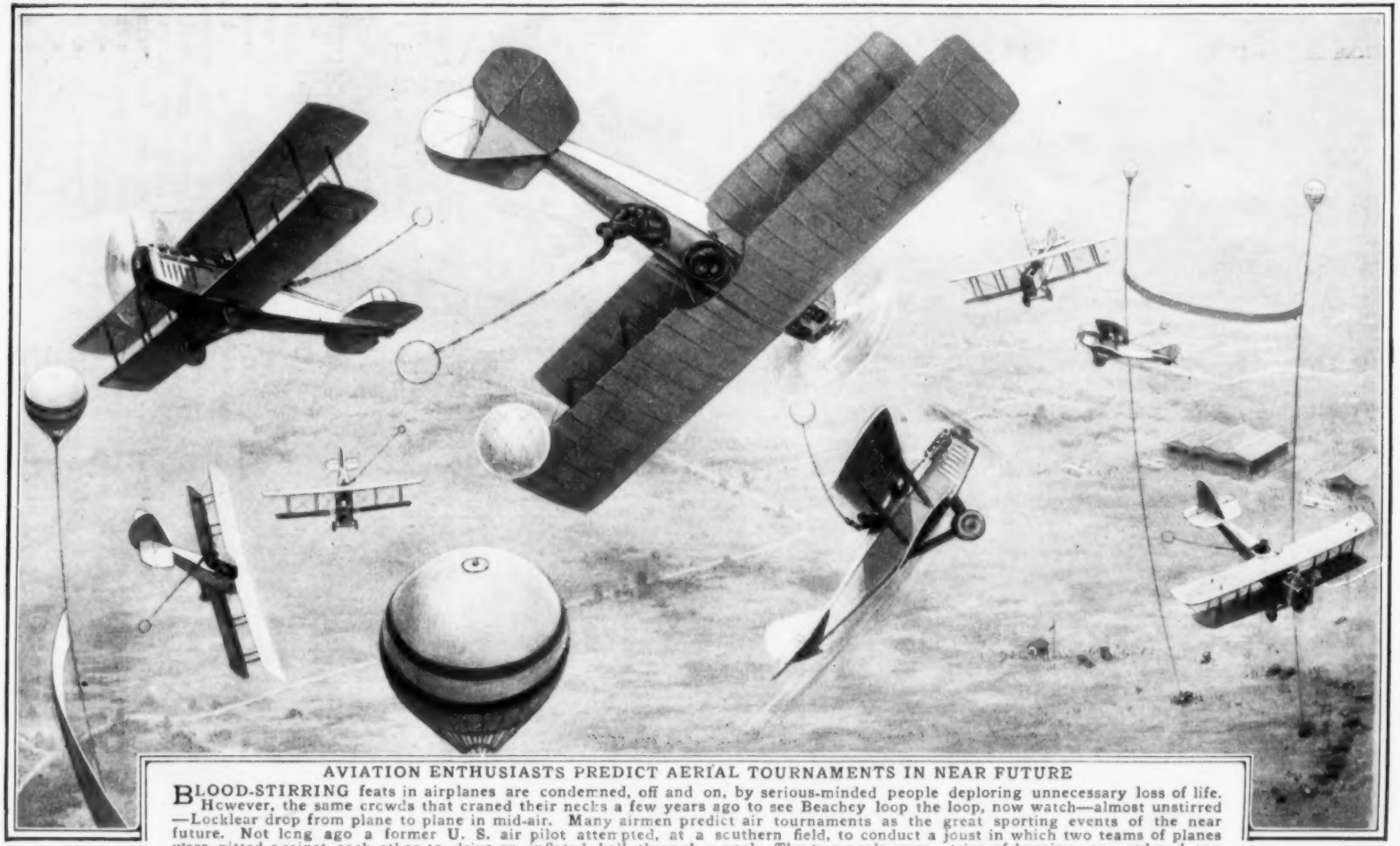
HEALTH BOARD'S CAR CARRIES THEATER AND LABORATORY

A picture theater and a health laboratory are two institutions that might reasonably be classed as immovable. Yet the health officials of an eastern state not only have made them mobile, but actually have combined both in the body of a single motor truck. The rear doors are hinged at top and bottom, and the lower half opens to make an extension floor, while the upper half roofs it over. A sectional projection screen may be mounted on one end of the truck roof, and a motion-picture machine at the other end; an engine, generator, and storage battery, inside, supplying current for showing good pictures, even in remote districts. For infant welfare and general clinical work, all the necessary apparatus is easily carried, as well as a small but efficient X-ray outfit.

The Traveling Health Theater, Set Up for a Performance, with Its Sectional Screen at One End of the Roof and the Projector at the Other

OLD-GOLD DYE MANUFACTURED FROM CHIMNEY SOOT

Dyes made from unusual material were used in coloring a collection of homemade woolen fabrics recently exhibited in London. Among them was one derived from chimney soot, which produced a beautiful old-gold tint. Others were obtained by utilizing various plants, including ferns, privets, and certain grasses. Leather goods, pottery, and jewelry, all hand-made, were other features of the display.

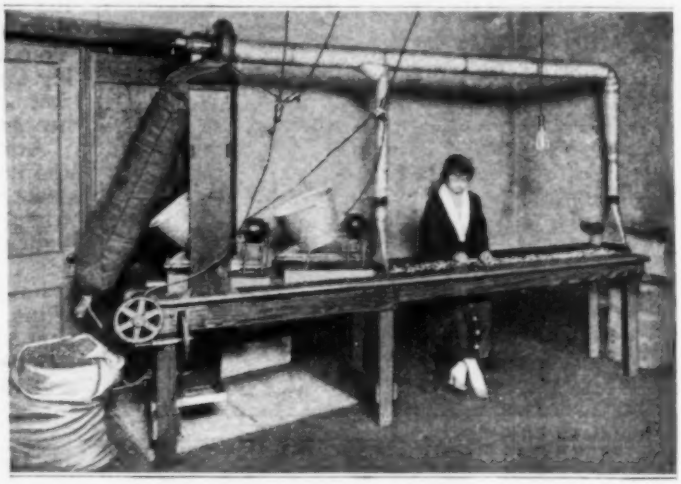


AVIATION ENTHUSIASTS PREDICT AERIAL TOURNAMENTS IN NEAR FUTURE

BLOOD-STIRRING feats in airplanes are condemned, off and on, by serious-minded people deploring unnecessary loss of life. However, the same crowds that craned their necks a few years ago to see Beachey loop the loop, now watch—almost unstirred—Locklear drop from plane to plane in mid-air. Many airmen predict air tournaments as the great sporting events of the near future. Not long ago a former U. S. air pilot attempted, at a southern field, to conduct a joust in which two teams of planes were pitted against each other to drive an inflated ball through a goal. The two goals were strips of bunting, one red and one blue, a mile apart, anchored to automobiles on the ground, and held suspended by captive balloons at a height of 1,000 ft. A referee in a centrally stationed balloon dropped the ball in mid-air and signaled the start of the game. The observers in the cockpits of the planes drove at the ball as illustrated. Needless to state, the attempt was not crowned with success, and possibly could not be carried out as planned. However, it serves as a good illustration of future possibilities in this field.

PEANUT BLANCHER REPLACES HUMAN LABOR

Peanut-blanching machines, with a capacity of 1,000 lb. a day, are now replacing the unskilled human labor which once handled this work. As a single worker can remove the brown skin from only 60 to 85 lb. a day, the superiority of the machine method is evident. In a popular form of this machine, the nuts are thrown, after shelling and roasting, into buckets, beneath whose bottom outlets turn two corrugated rollers. Dropping from the rollers, the nuts, now blanched, fall with the brown chaff upon a horizontal conveyor belt. In this way they are carried beneath the mouths of two suction pipes, hanging over the belt, which suck away the chaff, but allow the nuts to travel on, until they fall into a container.



The Nuts and Chaff, Separated, Fall from the Huskers at the Left upon the Conveyor Belt. This Carries Them beneath the Suction Pipe in the Center; Then before the Critical Eye of the Inspector; Next beneath the Second Suction Pipe, and Finally into the Barrel at the Right

FOREST LAND GIVEN AS SITE FOR CHICAGO ZOO GARDEN

In consequence of an individual's generous gift to Cook County, Ill., of suburban forest land worth $300,000, the city of Chicago may some day possess a zoölogical garden equal to those in New York, London, Paris, and Tokyo. The 150-acre tract is easily reached from the city, and is pronounced ideal for such use. Heavy timber, covering 60 acres, and traversed by a large creek, offers shelter to deer, buffalo, and similar animals. Other parts of the preserve seem intended by nature for use as bear pits, and kindred purposes.

AUTO FAILS TO LEAP GORGE AND FALLS HUNDRED FEET

The filming of an English movie "thriller" was punctuated recently by an unexpected incident that was fully as satisfying as anything called for by the scenario. The plot required the hero, impersonated by a dummy, to leap a seaside chasm in a motor car. The car failed to attain sufficient momentum, however, and fell short of the opposite brink. The tumbling fall of a hundred feet, with the glorious smash-up at the end, were both filmed, for future use. Another car succeeded in making the leap.

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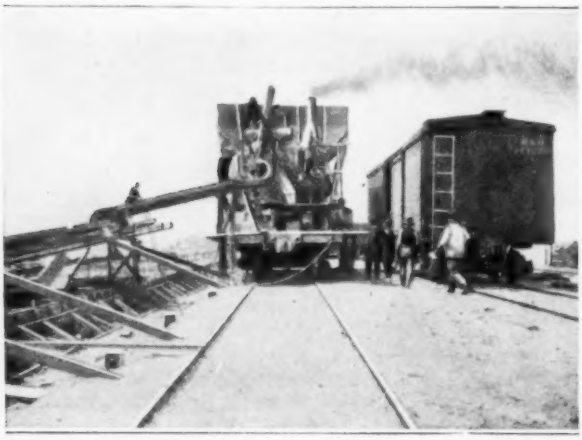
The Bridge having been Destroyed by the Villain, the Hero, Represented by a Dummy, was to have Leaped the Gorge in an Automobile. However, the Car Fell Short of the Opposite Brink

EXTENDING THE SEA WALL AT GALVESTON

By STANLEY W. TODD

THE famous sea wall at Galveston, Tex., has so often saved the city from destruction by tidal waves and hurricanes from the Gulf of Mexico, that a two-mile addition to it is being made, through the combined effort of the city, state, and Federal government. While under construction, another great storm broke against the wall and inundated the city, but did no serious damage.



Foundation Construction was Facilitated by Moving the Mixer along the Parallel Track

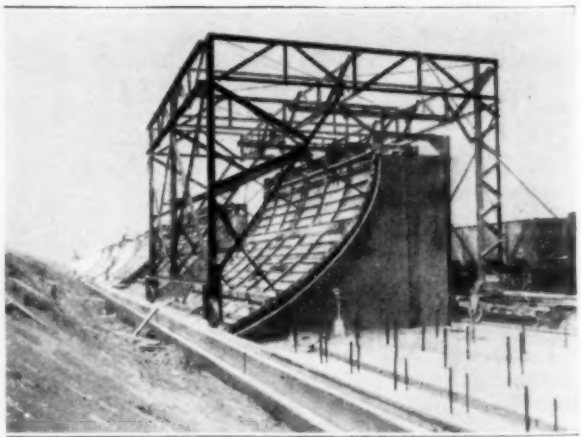
The original wall, built by army engineers three years after the great hurricane of 1900, is 3½ miles long and has stood intact for 15 years. Subsequent extensions were made along the south side of the city, making it, in all, five miles long. In 1915, a great flood damaged the boulevard back of the wall, and turned many of the cottages topsy-turvy, but the wall saved the city from serious encroachment. Since that time, there have been many efforts by the authorities to strengthen the wall and increase its length.

The new addition extends 10,300 ft. from the easterly extremity of the present wall. The county of Galveston is paying for 3,300 ft. and the Federal government for the remainder. To complete the protection to the big fort at Galveston, 10,800 more feet of wall will ultimately be necessary.

Army engineers have charge of the new work, which follows the same plan of construction as when the wall was originally built, except that machinery is being used more extensively. It is built of solid concrete on wood piling, which is cut off about 1 ft. above low tide, the concrete portion being 16 ft. wide at the base and 16 ft. in height, bringing the top elevation 17 ft. above low water. Behind the wall a paved surface rises inland to a crest elevation of 19 ft., 100 ft. from the face.

The Heavy Riprap was Handled Quickly by the Movable Derrick, beneath Which were Run the Loaded Gondolas

Before the construction was begun, a double-track railroad was built along the rear of the new wall, with portable switch tracks in the rear. On this all the necessa-

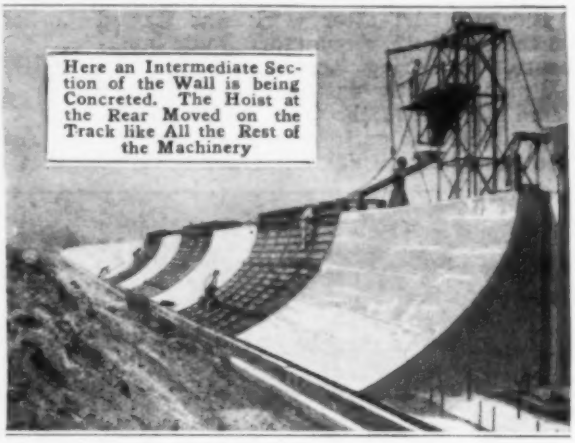


As the Wall Hardened, the Steel Forms were Moved from One Position to Another by Means of This Steel Traveler, Which Straddled the Wall and Moved on Tracks, as Shown

ry machinery was moved, including pile drivers, concrete mixers, cranes, and mixing plants on flat cars.

The steel forms used in building the wall were moved from one position to another as the wall hardened, by means of "travelers," consisting of specially designed steel frames which straddle the wall and run on tracks either side of the wall.

Following the completion of the wall, comes the placing of riprap on the outward side of the structure, this being accomplished by an improved traveler on which is erected a derrick. The flat cars, carrying the rock, run underneath, and facilitate the operation of getting the stones, weighing from 15 lb. up to five tons, in front of the wall, as an additional protection against the violence of the sea.



Here an Intermediate Section of the Wall is being Concreted. The Hoist at the Rear Moved on the Track like All the Rest of the Machinery

JERSEY CANAL TO FORM LAST LINK IN CHAIN

The present inadequacy of railroad transport between Philadelphia and New York City has resulted in renewed pressure on congress for a modern barge canal across New Jersey. With such a canal in operation, the water route between the two cities will measure about 85 miles instead of the present total of 274, which include the often hazardous course up the New Jersey coast. Probably because of its military value, the scheme has already received the attention of the U. S. Army. After careful survey, the chief of engineers has recommended that the canal leave the Delaware River a few miles below Trenton, then cut straight northeast, through the Jersey swamp lands, to Raritan Bay. As such a routing means easy digging, it is advised, too, that the canal be cut to sea level, only one lock being installed at the southern end for protection against spring freshets. When completed, such a waterway will form the last link in a sheltered barge route, that will traverse the coast from Virginia to Massachusetts, and which already taps the Great Lakes by means of the Hudson River and the New York State Barge Canal.

The Value of the Proposed New Jersey Ship Canal to Coastal Commerce Is Evident from the Map. Coal from Norfolk will Go Up to New York, Not over the Railroad, But in Capacious Barges. The Most Obvious Gain Is the Shortening of the Water Route between New York and Philadelphia

BY COURTESY OF THE NEW YORK TIMES

CARPENTERS ERECT BUNKHOUSE IN REMARKABLY SHORT TIME

Eleven hours after work was started on the structure, a two-story frame bunkhouse, furnishing accommodations for 108 men, recently was completed in every detail at Flint, Mich. This modern building miracle was performed by a construction company which is erecting 1,000 homes for the employes of a large manufacturing concern in that city. Word came, late one afternoon, that 100 laborers would arrive the next day from the south. As no provision had been made to shelter these men, it was necessary to make great haste. Promptly at 6:30 o'clock the following morning, 40 skilled carpenters began operations. At 5:30 o'clock that afternoon, the building was finished. Material was hauled a quarter of a mile to the site by truck and other means.

At Eight o'Clock, One and a Half Hours after Starting Work, the Frame of the Bunkhouse Was Well Up

By Noon, the Second Story was Framed, the Sheathing of the First Story Was Complete, and the Sashes had been Placed

At Half Past Five That Night, When the Workmen Quit, the New Bunkhouse Was Complete, and Ready to Receive Its 108 Tenants

DISTILLATION OF WOOD WASTE AIDED BY ODD MACHINES

Among the many industrial processes that the pressure of war brought forth, improvements in the distillation of wood are distinctly interesting. Instead of using good, seasoned timber, green wood waste and sawdust now produce acetates, alcohol, oil, tar, and charcoal of the highest grade. The secret of the process, as operated in a large plant in the Tennessee forests, lies in the briquetting of the finely divided wood in a special press. This machine first mechanically compresses its charge to five-inch thickness. At this stage a charge of gas and air is exploded behind a piston, as in a gas engine, and the force of the impact is directed upon the brick. The result is a hard briquette two inches thick, and heavier than water. These are automatically loaded into tubular retorts, and heated under pressure for 2½ hours, while the products of distillation are drawn off. Accurate control of the heat produces bricks of unusual quality and reliability.

Great difficulty has been found in constructing an electric immersion heater that would withstand the destructive action of boiling acids. A quartz tube filled with an inert gas, and containing a heating coil of nickel or alloy for low temperatures, or of tungsten if greater heat is needed, is now being used with success by French scientists. Such an element of 1-kw. size is approximately 16 in. long and ⅝ in. diameter, and is remarkably resistant to shocks of temperature change.

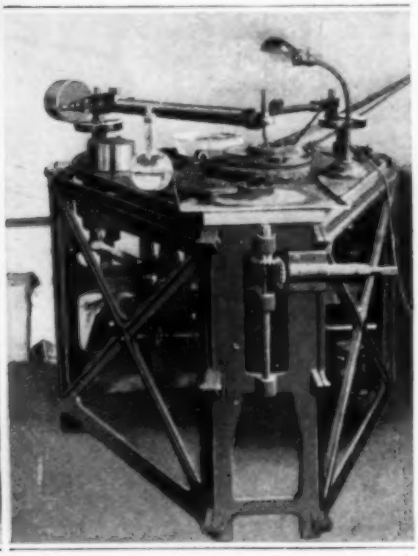
SOLVE PROBLEM OF WEEVILS IN AUSTRALIAN WHEAT

Of all the lesser battles against disease and famine, that hung upon the great war like side shows around a satanic circus, not the least serious was the fight to save neglected food supplies from their biological enemies. Millions of bushels of wheat in Australia, stacked in sacks under cover but on the bare ground, became literally alive with weevils. An electrical potential of 63,000 volts left the minute pests unharmed. Finally a special plant was built, and all the wheat subjected to heat at 140° F., and then the little beetles and their larvæ succumbed. The new crop was stacked on sleepers covered with cloth, laid on ground impregnated with tar oil, or dressed with lime and naphthalene. This system proved wholly successful, and the weevil army was routed—probably forever, for the effective warfare is to be continued.

BEST-QUALITY OPTICAL GLASS NOW MADE IN AMERICA

Only a few years ago practically all the high-grade optical glass used in this country was imported. In no industry has independence been more quickly achieved. Each application of glass to optical purposes requires a different composition, but these dozens of formulas and processes have been completely mastered by the American workmen. No less difficult is the manufacture of the clay crucibles in which the glass is melted, the clay then being broken from the finished product with hammers. The glass is cast in huge lumps, as much as two feet across, from which the blanks for lenses are cut. Automatic machines have been in use for some time which grind these blanks into finished lenses with a minimum of attention, and in many cases they are left to operate alone for hours. They are quite simple mechanically, in spite of the remarkable work they accomplish, and greatly accelerate the difficult process of lens making, as hand grinding is a long and tedious operation.

Ingot of Optical Glass as It Comes from the Furnace: The Workman is Breaking Away the Clay Crucible with a Sledge Hammer



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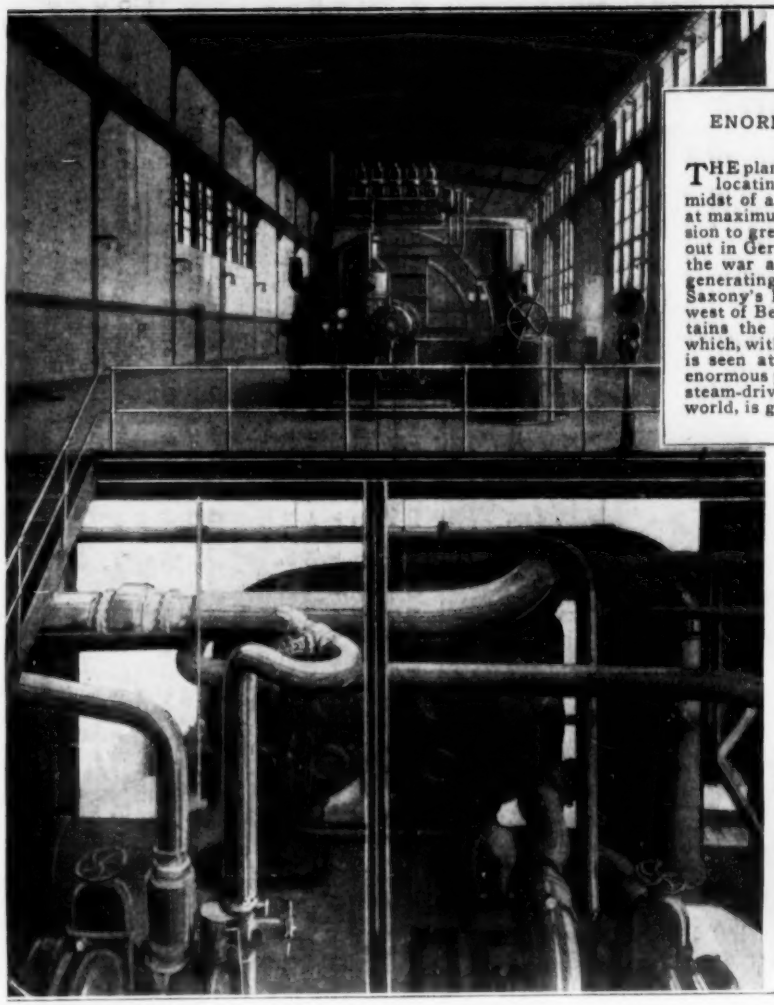
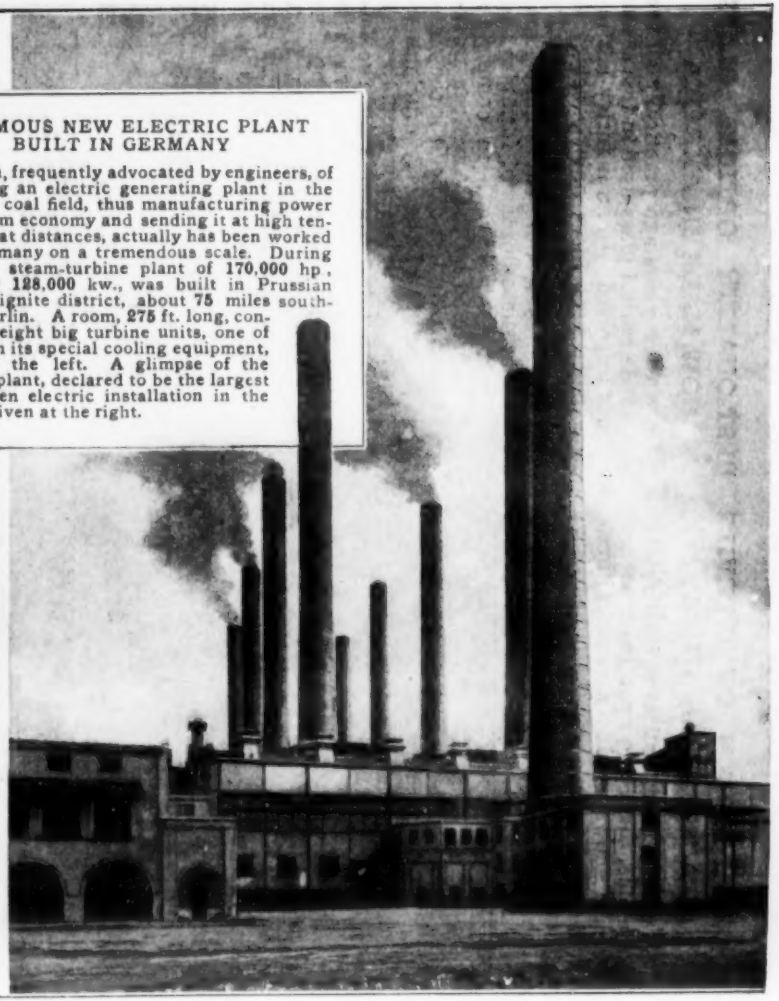
Some Typical Lumps of American Optical Glass, as Cast in the Furnace, are Seen at the Left. At the Right Is a View of the Automatic Lens-Grinding Machine, Which Finishes the Blanks Cut from the Large Lumps

¶An electric light inside the hood, set to throw its rays upon the side of the engine that carries all the accessory equipment, is a simple but highly convenient feature in the latest model of a high-grade auto.

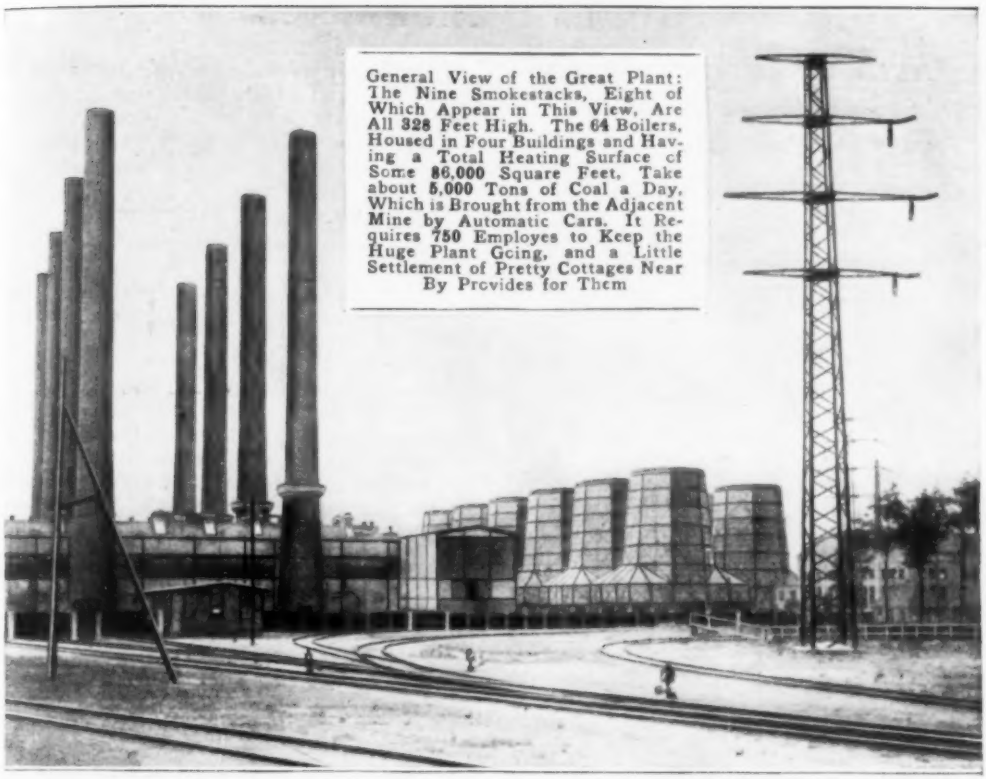




ENORMOUS NEW ELECTRIC PLANT BUILT IN GERMANY

THE plan, frequently advocated by engineers, of locating an electric generating plant in the midst of a coal field, thus manufacturing power at maximum economy and sending it at high tension to great distances, actually has been worked out in Germany on a tremendous scale. During the war a steam-turbine plant of 170,000 hp., generating 128,000 kw., was built in Prussian Saxony's lignite district, about 75 miles southwest of Berlin. A room, 275 ft. long, contains the eight big turbine units, one of which, with its special cooling equipment, is seen at the left. A glimpse of the enormous plant, declared to be the largest steam-driven electric installation in the world, is given at the right.

WIDE WORLD PHOTOS



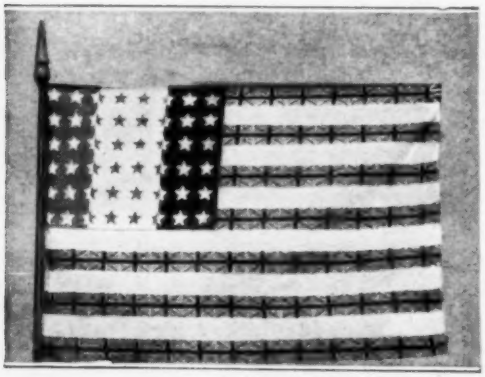
General View of the Great Plant: The Nine Smokestacks, Eight of Which Appear in This View, Are All 328 Feet High. The 64 Boilers, Housed in Four Buildings and Having a Total Heating Surface of Some 86,000 Square Feet, Take about 5,000 Tons of Coal a Day, Which is Brought from the Adjacent Mine by Automatic Cars. It Requires 750 Employes to Keep the Huge Plant Going, and a Little Settlement of Pretty Cottages Near By Provides for Them

The Outgoing Side of the Plant, Where the High-Tension Cables, Supported by Heavy Strain Insulators, Carry Their 128,000 Kilowatts to the Distributing System. Of This Berlin is Receiving Some 30,000, and the Amount is to be Increased as Soon as Additional Transmissior. Facilities can be Installed

WIDE WORLD PHOTOS

ALTERED AMERICAN FLAG CAUSES NEAR RIOT

Some one in Washington, D. C., recently ruined many yards of bunting by marking and cutting it into variations of the American emblem, calling the resulting banners "Humanity Flags." The conception was ingenious, at any rate. Rows of little Union Jacks replaced the red stripes, while the French tricolor formed the field for the stars. Shortly after the display of the flag in a local shop window a crowd gathered, and indicated that it preferred its patriotism "straight." The police reserves dispersed the gathering, and the district attorney stopped the sale.



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This Variation of the American Flag Caused a Near Riot in the National Capital. Union Jacks Replace the Red Stripes, While the Tricolor Forms a Field

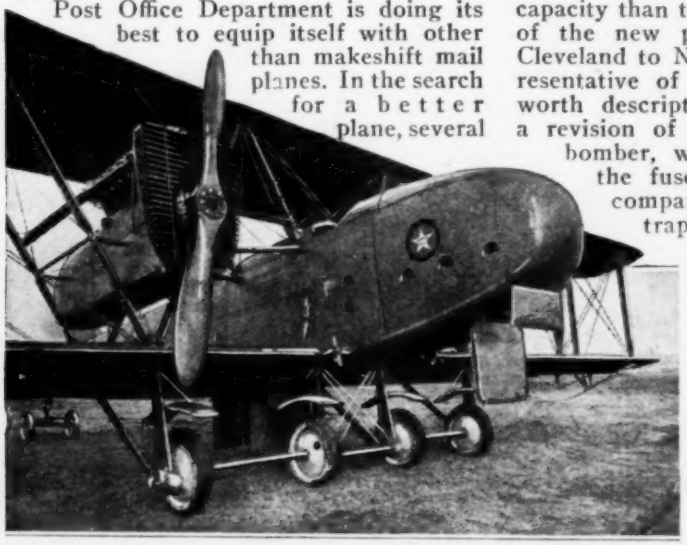
HOLLOW-STEEL OBJECTS MADE BY CENTRIFUGAL CASTING

Experiments conducted by certain governmental bureaus promise to develop a practical method of making hollow cylindrical steel objects by centrifugal casting, instead of forging. While the test pieces produced showed some separation of the carbon, nickel, sulphur, and other constituents of the steel, the amount was inconsiderable, and appeared almost entirely on the inner surface, which also was the only area affected by blowholes. The casts were clean, of unusually good microscopic structure, and after proper heat treatment were quite comparable in quality with forgings.

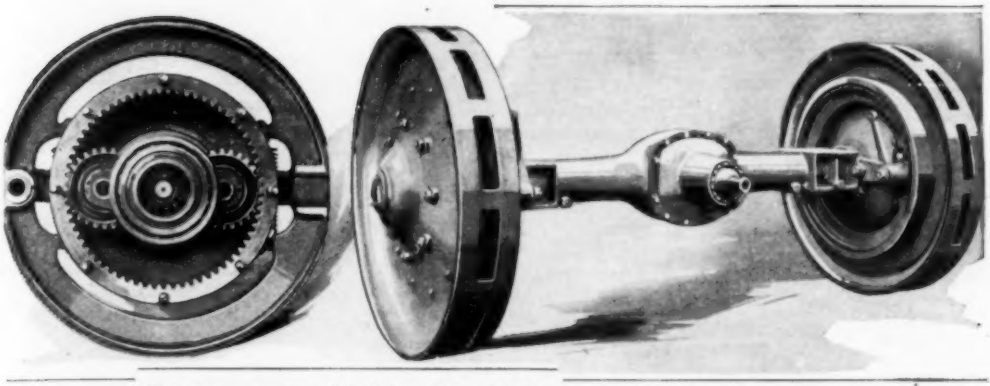
¶Chicago's viking ship, built in Norway years ago for the Columbian Exposition and sailed across the Atlantic in emulation of Leif Ericsson's voyage, is now being overhauled and will soon be given a place of honor in a popular lakeside park.

MAIL TO BE CARRIED BY LARGER CARGO PLANES

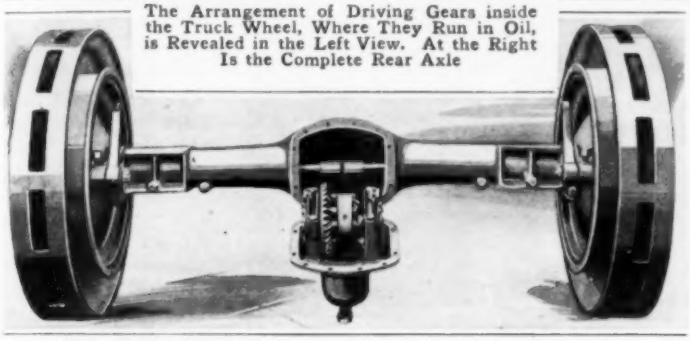
Despite the wholesale scaling down of appropriations for the aerial mail, the Post Office Department is doing its best to equip itself with other than makeshift mail planes. In the search for a better plane, several types have already been evolved, all of them multi-motored and of much larger capacity than the DH-4's now used. One of the new planes recently flew from Cleveland to New York City, and as representative of a promising type is well worth description. It is fundamentally a revision of the familiar twin-engined bomber, with most change seen in the fuselage. In five large mail compartments, four of them with trapdoors that may be released from the pilot's seat, are carried 1,500 lb. of mail, more than four times as much as in the present plane. An endurance of six hours and a speed of 115 miles gives the plane a flight radius of nearly 700 miles. In addition to the plane illustrated, five others have since been completed, all of them believed to be meant for winter service on the New York-Chicago run.



This Airplane Is One of Six Recently Completed for the Postal Service. The Mail is Carried in Compartments Which are Provided with Trapdoors to Permit Nonstop Delivery of the Pouches



The Arrangement of Driving Gears inside the Truck Wheel, Where They Run in Oil, is Revealed in the Left View. At the Right Is the Complete Rear Axle



Differential Case Open, Showing the Unit Mounting of Bevel and Differential Gears on the Cover, Making Them Easily Removable

INVISIBLE RAYS OF LIGHT USED FOR SIGNALING

A narrow beam of light from the extreme red end of the spectrum is invisible to ordinary view, but becomes visible through a screen of the same color value when other light is excluded. This principle was successfully used for secret signaling during the war. Ultraviolet light was employed in somewhat different manner. Generated by a mercury arc and filter, it was received on a fluorescent screen, after concentration by a lens. Without any effort to direct the beam, this equipment had a range of about four miles. A curious effect was the fluorescing of teeth and eyeballs in the received ray.

IMPROVED MOTOR-TRUCK AXLE CARRIES GEARS IN WHEELS

By placing the reduction gearing as close as possible to the point where it is needed, the rim of the wheel, the makers of an improved form of rear axle for motor trucks gain a number of advantages. The higher speed of the differential gear and floating axle, and the consequently smaller torque on the driving members, permit the use of lighter weight and reduced size for all parts of the drive. Each rear wheel carries an internally toothed gear, engaged by a pair of idler gears on a fixed yoke. A pinion on the axle end operates the two idlers. This whole planetary arrangement runs in oil, the closed wheel making a dust-tight housing. The cover of the differential case constitutes a carrier on which the bevel and differential gears are mounted as an easily removable unit. One of the advantages claimed for this drive is that reduction at the wheel diminishes the danger of skidding. It is asserted also that tire and fuel economies are effected.

LITTLE WIND INSTRUMENT PLAYED THROUGH NOSE

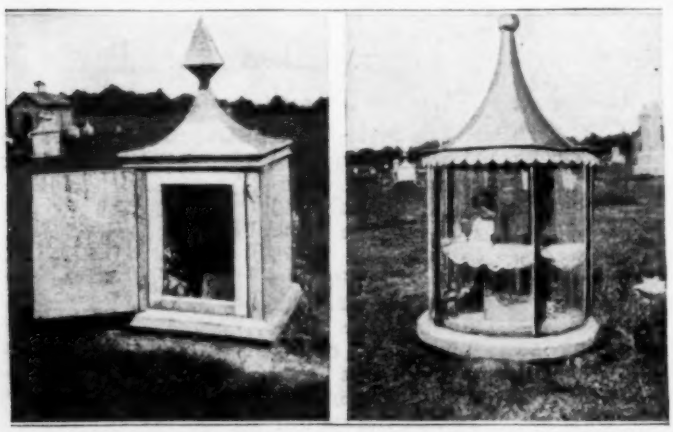
The little wind instrument pictured on this page can be played with little or no practice. Placing the V-shaped end of the tube against the nose, and pressing the plate against the mouth, the performer blows through his nostrils. Passing a hole in the mouth plate, this air stream causes vibration of the air in the mouth, and produces a corresponding tone.

WHOLE STEERING POST LOCKED BY NEW AUTO FASTENER

Designed to fasten the steering gear rigidly in any desired position, a new automobile lock, marketed by a Wisconsin concern, extends its locking member the whole length of the steering column. The lock itself, just below the wheel, has 19 tumblers and hundreds of combinations. A long tube inside the steering column, raised and lowered by a hand lever, carries at its lower end four dogs, which interlock with four keyways in a lug fixed to the worm-gear housing. It is readily built into any standard steering post, or may be installed as a complete new unit.

ODD GRAVE MARKERS CONTAIN RELICS OF THE DEAD

Scattered through a graveyard in southern Indiana are strange grave markers which look from a distance like squat tombstones, but on closer view are seen to be painted boxes of galvanized iron. One side of each is a door, which swings open to disclose a collection of keepsakes and relics. A typical assemblage includes a photograph of the dead, his childish playthings, a few religious images, and a Bible. The box is usually surmounted by an ornamental cornice with a little dome or steeple; the tight-fitting door is ordinarily padlocked against theft.



These Little Boxes of Glass and Galvanized Iron Contain Relics of the Dead, and Supplant the Conventional Markers of Stone. The Glass Cylinder at the Right is Surmounted by an Iron Cupola. Most of the Boxes Resemble the One at the Left

DRINKING-FOUNTAIN NOZZLE PROTECTED BY GUARDS

Ingeniously arranged guards prevent water that has touched the lips of persons using a new drinking fountain from contaminating the nozzle of the device, which is declared to be germ-proof. A stream of water is thrown through the protective contrivances, practically without coming in contact with them. Two of the shields are in the form of perforated hoods, the smaller placed within the larger, while a third, made from wire, is fastened to the outer hood. Waste water flows into a basin, and is carried away by a drain.

PLAN AUTOMATIC TELEPHONES FOR BIG CITY EXCHANGES

Mechanical telephones, which connect their users directly with the numbers they want by the turn of a dial, without the aid of any operator, are gaining ground rapidly. Two large exchanges in Chicago's business district are to be made automatic as soon as the huge task of reconstruction can be accomplished. The necessary alterations will be started next September, and it is thought the new system can be placed in full operation in the first part of 1922. A similar project is being considered in New York City, and the exchange at Norfolk, Va., already has been cut over to automatic.

As a Lasting and Useful Memorial to Local Service Men, the City of Santa Monica, California, is Considering the Erection of This Open-Air Theater. It will Take the Conventional Grecian Form, with Seats Arranged in Concentric Tiers, Orchestral Area in the Center, and Pillared Stage at the Bottom of the Slope

CITY PLANS GREEK THEATER AS SOLDIER MEMORIAL

A beautiful open-air theater, similar in plan and purpose to the one at Berkeley, is the memorial to local soldiers now being considered by the citizens of Santa Monica, Calif. As in the conventional theater of ancient Greece, the site will be a wooded hillside. Replacing the concentric tiers of stone benches at the slope bottom, will stand the stage, with pillared portico and traditional side wings. The level area in the center will be floored with mosaic stone work.

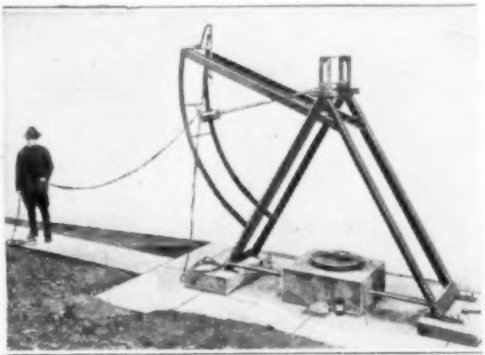
EXTENSION GROOVE IN RECORD WORKS PHONOGRAPH STOP

The automatic stop, with which many modern phonographs are equipped, need not be reset for each selection when the disk record used is one of a new brand just placed on the market. A spiral extension groove, running toward the center of the record, continues to move the needle inward after the end of the playing groove has been reached. The tone arm thus actuates the stop at a certain definite point at all times, regardless of the length of the selection.

¶Season checks in oak stock for furniture making can be prevented, government authorities state, by piling the stock with the quarter-sawed surfaces at top and bottom and the sides close together, thus retarding the rate of drying.

SENSITIVENESS OF EXPLOSIVES DETERMINED BY TESTS

Premature explosions caused by the ignition of blasting material through friction have injured many miners. To reduce the possibility of such accidents, the Bureau of Mines now carefully tests samples of commercial explosives, using an ingenious device for this purpose, and issues informative tables based on these trials. The contrivance includes a pendulum, suspended from a metal frame, and equipped with a curved shoe, which swings over the face of a steel anvil. When a test is made, an explosive is placed in three grooves in the latter, and the pendulum released and allowed to swing over the surface prepared in this way. A wood-fiber facing is attached to the shoe for some of the tests.



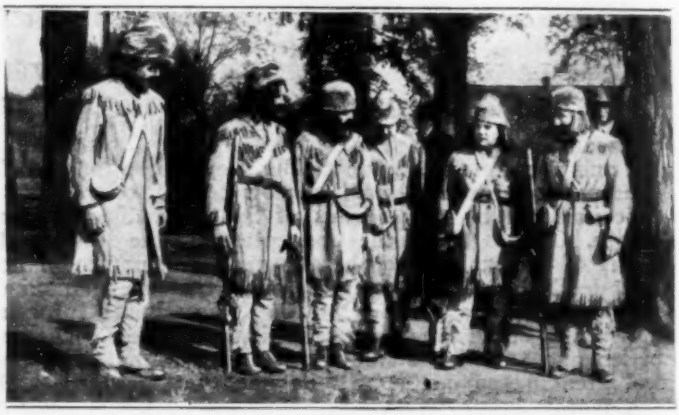
Apparatus Employed by the Bureau of Mines in Testing Samples of Commercial Explosives to Ascertain Their Sensitiveness to Friction

Woodsmen and Trappers Reënacted Century-Old Scenes at the Centennial Celebration

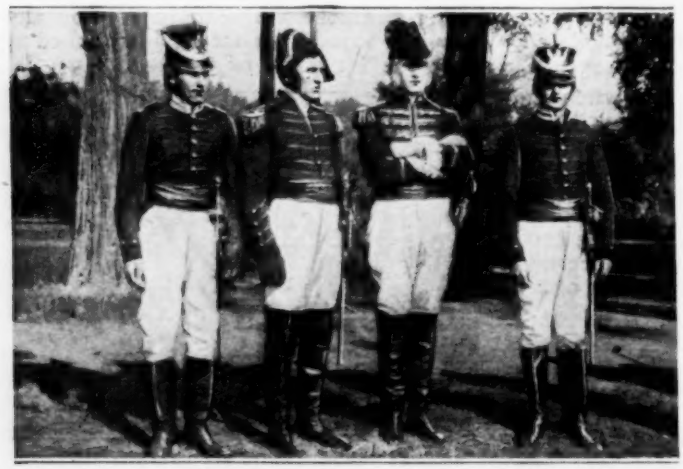
NEBRASKANS RE-ENACT HISTORY AT CENTENNIAL CELEBRATION

One hundred years ago a clumsy side-wheel steamboat, the "Western Engineer," plowed its way through the muddy waters of the Missouri River to a point near the present town of Calhoun, Neb., and landed a small party of soldiers. In this way was founded Fort Atkinson, one of the first white settlements in the western state. Celebrating the centennial of this event, the citizens of Calhoun recently staged an elaborate pageant, a feature of which was a realistic reënactment of the just-described historical occurrence.

A huge painting, 12 ft. high and 78 ft. long, depicting the vessel which carried the pioneers to their destination, was employed as a background for the show. Dressed in the military uniforms of another century, and in the picturesque habiliments of early trappers and woodsmen, local men impersonated members of the original expedition, while women of the community, wearing old-fashioned clothing, played suitable rôles. Descendants of Indians who witnessed the arrival of the whites also took part in the exhibition.



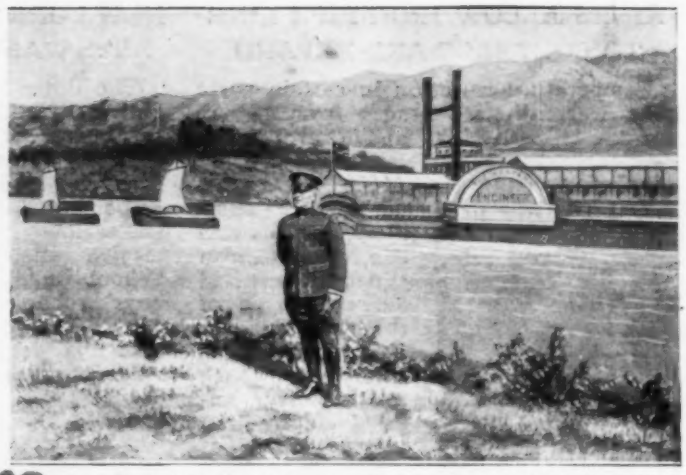
Trappers and Scouts of 1919, in the Picturesque Garb of 1819, Carried Out the Spirit of the Event and Aided the Stage Setting in Contributing Historic Color



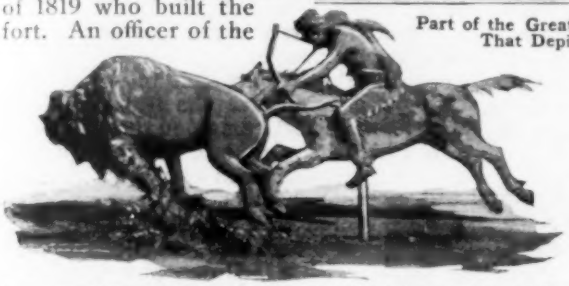
The Citizens Who Impersonated Colonel Atkinson and His Staff Appeared in the Ancient Regimentals of the Day When the Fort was Founded

Thousands attended the affair, many coming from far-distant places. Among the visitors was a grandson of the commander of the founders of the post, who traveled

halfway across the continent to be present. The village was appropriately decorated for the occasion. Many of the designs were quite striking in their realism, a particularly noteworthy set being a group of statuary depicting a mounted Indian hunter, armed with bow and arrow, about to dispatch a huge buffalo which his horse had overtaken. Almost the only modern figure in evidence was the descendant, already mentioned, of the army leader of 1819 who built the fort. An officer of the United States Army himself, he appeared, of course, in the conventional khaki. The accuracy of the reproductions was made possible by careful records kept by a local historian of advanced age, who is custodian of a collection of relics of the old fort, and was the promoter of the centennial celebration.



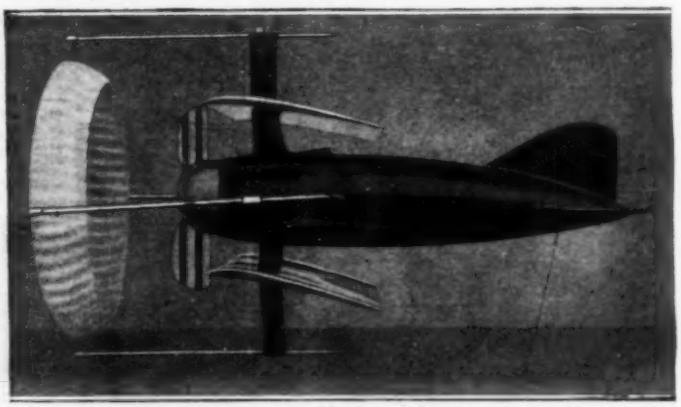
Part of the Great Canvas, 78 Feet Long and 12 Feet High, That Depicted the Landing of the Good Ship "Western Engineer," at the Site of Fort Atkinson



A Group of Statuary in the Streets of Calhoun, One of the Decorations Prepared Especially for the Event of the Centennial

"SHROUD" TO INCREASE PROPELLER EFFICIENCY

As airplane flight is absolutely dependent upon speed, aeronautical engineers are constantly studying, and experimenting with, the aerial propeller. Yet the present system of airplane propulsion remains tremendously inefficient. It is accordingly worth noting that one investigator, leaving to others the perfection of the propeller itself, is attempting to make its action more efficient by manipulating the air in which it operates. This he accomplishes by mounting, several feet in front of the fuselage, an annular "shroud" of diameter slightly greater than that of the propeller itself. Able to vary in flight the diameter of the shroud's trailing edge, with respect to the diameter of the leading edge, the pilot will, it is hoped, have fuller control of propeller performance. Decreasing the "trailing diameter" to a minimum, he will theoretically be able to make a landing within a few feet.



On This Little Wind-Tunnel Airplane Model the Inventor has Mounted His Annular Shroud Which is to Stabilize and Control the Air "Fed" to the Propeller

KINKS ALLOW IRON-PIPE LINE TO CONTRACT AND EXPAND

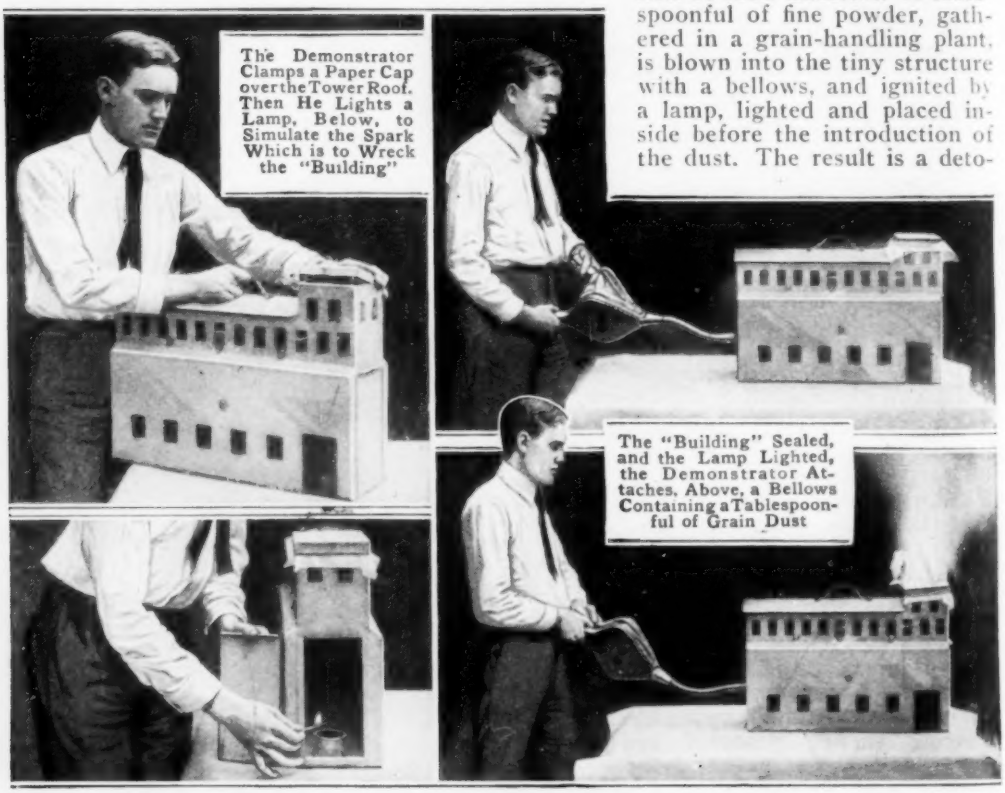
Temperature variation in certain parts of a western state ranges from 18° F. above zero, in the winter, to 130° F. above the same point, in the summer. For this reason, when an iron aqueduct was laid across one of these regions recently, it was necessary to make provision for unusual contraction and expansion of the conduit. This was accomplished by kinking the pipe at quarter-mile intervals, forming large U-shaped bends, which are held in upright position by bracket-equipped posts along the right of way.

NEW YORK COMMERCIAL SCHOOL BUYS WALL STREET LANDMARK

The down-town classes of New York University's School of Commerce will no longer be held in the offices, exchanges, and restaurants of Wall Street. The 2,000 students, drawn from the most important financial and industrial organizations in America, are shortly to receive their instruction in Trinity School Building, erected in 1871 for the boys' school of Trinity Church, next door. The four floors of the old structure will contain, besides classrooms, a students' clubroom and a restaurant.

ELEVATOR-EXPLOSION DANGER SHOWN BY MODEL BUILDING

For demonstrating the danger of grain-dust explosions in improperly operated elevators, the Department of Agriculture employs a miniature sheet-iron building in an educational campaign, now in progress, which has for its object the prevention of such disasters. A tablespoonful of fine powder, gathered in a grain-handling plant, is blown into the tiny structure with a bellows, and ignited by a lamp, lighted and placed inside before the introduction of the dust. The result is a deto-



The Demonstrator Clamps a Paper Cap over the Tower Roof. Then He Lights a Lamp, Below, to Simulate the Spark Which is to Wreck the "Building"

The "Building" Sealed, and the Lamp Lighted, the Demonstrator Attaches, Above, a Bellows Containing a Tablespoonful of Grain Dust

The Bellows Compressed, as Seen at the Lower Right, the Grain Dust Permeates the Air within the "Grain Elevator," is Exploded by the Lamp, and Bursts the Heavy-Paper Cap. The Demonstration Never Fails to Impress Grain Men with the Necessity of Keeping Their Buildings as Free from Dust as Possible

Equipment with Which the Blind Students are Taught the Art of Core Making

Some of the Patterns Made at the School by the Sightless Craftsmen Who have Finished the Course

Flask and Other Foundry Implements of the Classroom are Seen at the Left; Materials Used Are at the Right, Including Pig Iron, Gray Cast Iron, Wrought Iron, and Soft Steel

nation of considerable force. To prevent the blast from damaging the device, a piece of heavy paper is fastened over the elevator head by means of an elastic band. When the charge is set off, the covering bursts. Cleanliness and the installation of efficient ventilating apparatus will reduce the peril of grain-dust explosions, according to authorities.

BIG TANK ERECTED TO ASSURE CITY UNFAILING GAS SUPPLY

That it may handle without difficulty the peak loads imposed when cold or dark days force the city's demand to abnormal, the local gas company has erected at Chicago the largest gas tank west of New York City. The giant container, when fully inflated, holds 10,000,000 cu. ft. of gas, adding 20 per cent to the company's former storage capacity. The entire structure, 228 ft. high and 273 ft. in diameter, contains 4,300 tons of steel, and is held together by 1,350,000 bolts and rivets. While the gas capacity is exceeded by several holders in the eastern metropolis, the water tank, at the bottom, holding 16,000,000 gal., is the largest ever built of steel for such a purpose. The total cost was about two million dollars.

BLIND VETERANS INSTRUCTED IN CORE MAKING

Sightless soldiers are learning many useful trades in the Red Cross Institute for the Blind, at Baltimore, Md. Among them is core making. In spite of their handicap, many of the veterans have developed remarkable skill in this difficult work, and are able to produce results that are seldom equaled by persons who are aided by good eyes. The course in core making is divided into two parts. In the beginning, students are made familiar with the operations of modern foundries, and instructed in the methods used in molding simple castings, such as washers, nuts, dumb-bells, drip cups, and other articles. After this somewhat elementary training, the apprentices study more complicated phases of the subject, and learn how to use the various devices employed in the trade. Practical core-making exercises are part of the course.

¶The famous Krupp armament factories at Essen, Germany, are now silent, or converted to the manufacture of railroad rolling stock, and repair work. The testing grounds near-by are being used for agricultural experiments.

SCHOONER RESCUES TRAPPERS FROM ARCTIC ISLAND

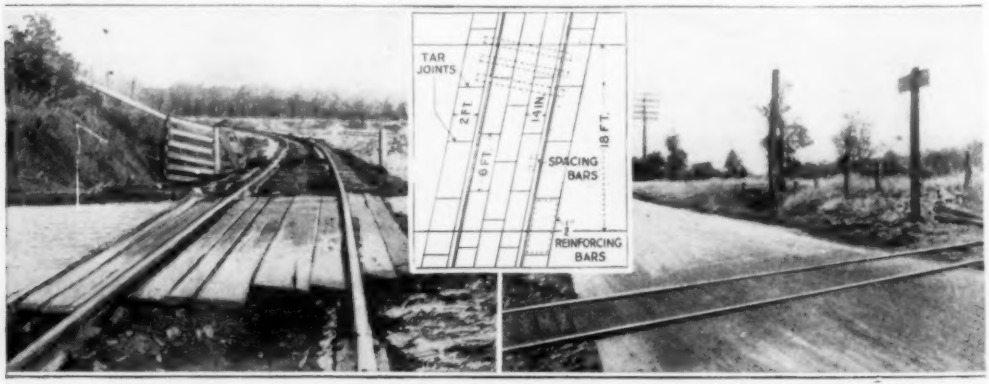
After a long and perilous cruise in far northern waters, the gasoline-driven schooner "Herman" returned to San Francisco recently, carrying a party of trappers, who were rescued by the vessel from Banks Land, a barren island, where they had been isolated for two years. Others on board were two survivors of the Stefansson expedition, which went into the arctic regions six years ago to chart ocean currents. Incidentally, the ship brought to this country one of the most valuable fur cargoes ever landed on the western coast.

The Gasoline-Driven Schooner "Herman," Which Rescued a Party of Trappers from an Arctic Island, as It Appeared at the End of the Voyage

To reach the marooned men, the craft had to blast a passage of many miles through an ice floe, which was at first thought impenetrable. When the vessel reached them, the trappers had exhausted their supply of ammunition, with which they had obtained food by hunting, and the band was facing death from starvation. During the eventful voyage, the schooner's engines consumed nearly 35,000 gal. of gasoline, and when port was reached, only 50 gal. remained in the fuel tanks.

CONCRETE GRADE CROSSINGS REPLACE UNSAFE PLANKS

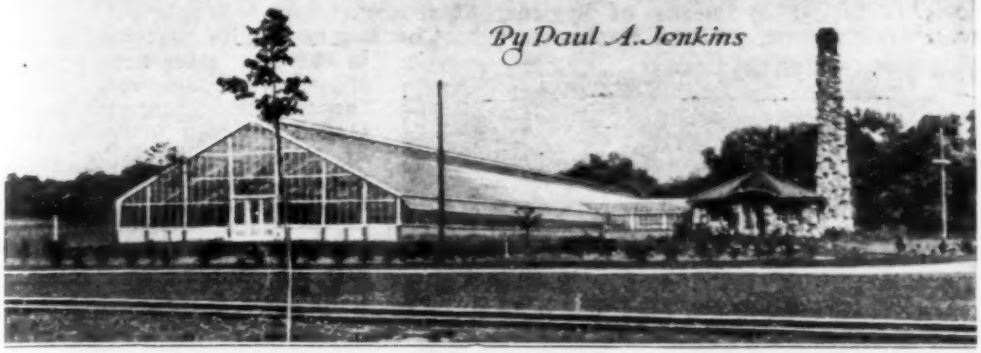
Better in appearance than planks, besides being much safer, the railroad grade crossings recently installed in Wayne County, Mich., are unusual public improvements. A solid block of concrete, extending 1 ft. below the bottom of the ties, and to a level with the upper edge of the rails, forms a smooth, practically indestructible roadway across the tracks. Consideration is being given a proposal to substitute premolded reinforced-concrete slabs, 6 ft. long, slightly over 1½ ft. wide, and as thick as the height of the rails, for the solid block, these to be laid between and at the sides of the rails and bound together with tar. When necessary, the slabs can be removed, permitting repairs to be made to the track, and are replaced with little difficulty or loss of time.



At the Left Is the Old-Fashioned, Unpleasant Plank Crossing, and at the Right, the Improved Inter-Rail Surface of Concrete, Recently Installed along Grade Crossings in Wayne County, Michigan. An Alternative Construction is Indicated in the Inserted Diagram

GREENHOUSE SHELTERS UNIQUE SCHOOL

By Paul A. Jenkins



This Greenhouse Shelters the Moraine Park School, Where Several Score Children are being Prepared for Life in a Manner Altogether Unconventional. The Interior of the Odd Schoolhouse is Partitioned into Classrooms, Offices, Workshops, and Other Rooms Adapted to the Requirements of the Strange Curriculum

FRAMED by trees and fertile fields, at the end of a 20-minute trolley run from Dayton, Ohio, there stands a large greenhouse, the sunlit interior partitioned into classrooms, offices, workshops, library, playroom, gymnasium, and a large study hall. Once the greenhouse was the showplace of a country estate; now it houses the Moraine Park School, one of the most pregnant experiments in the history of American pedagogy.

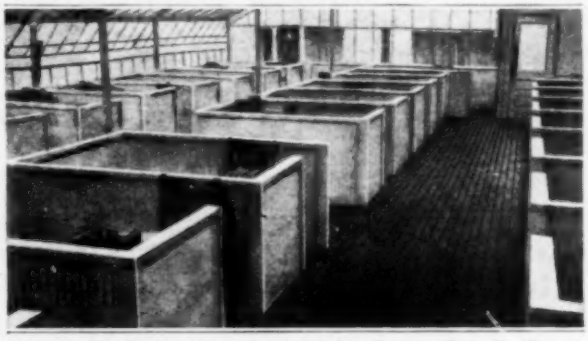
Under this broad glass roof are being educated four-score children, of ages ranging from 6 to 17 years, from the homes of Dayton's engineers. Many of these men are of national reputation; eight of them constitute the Board of Directors.

As might be expected from an exterior so unusual, the curriculum of Moraine Park School is also unusual to the n-th degree. Believing that education should be a preparation for life, rather than a cloistered prelude, the directors, teaching staff, and student body, working together, have evolved a program which assigns conventional "studies" to second place. They become a means and not an end. First place goes to nine so-called "occupations," proficiency in which fits the child for the fullest physical, mental, and spiritual life. Thus the "Occupation of Creating," developing habits of independence and resourcefulness, is taught by means of vocational work and English composition, among other

QUALITIES ABOUT THE HOME	Excellent	Very Good	Good	Fair	Poor	Unsatisfactory
COURTESY						
MANNERLINESS						
SPIRIT OF HELPFULNESS						
CHEERFULNESS						
PROMPTNESS						
PERSONAL APPEARANCE						
DILIGENCE						
OBEDIENCE						
RIGHT USE OF SPARE TIME						
CARE OF HEALTH						
IMPROVEMENT OVER LAST MONTH						

LIST IN BLANK SPACES ANY QUALITIES YOU CARE TO ADD

The Pupil's Life at Home is Considered a Vital Part of His Education. In Consequence, the Parents Send This Report to the School, Each Month, Just as the School Sends One to the Home



This Is the Study Hall and Assembly Room. The Pupils are Assigned in Pairs to the Stalls, and Are Responsible for Their Care

subjects. The "Occupation of Self-Realizing," developing the intimate personal virtues, is taught by means of hygiene, worship, literature, art, and music. And

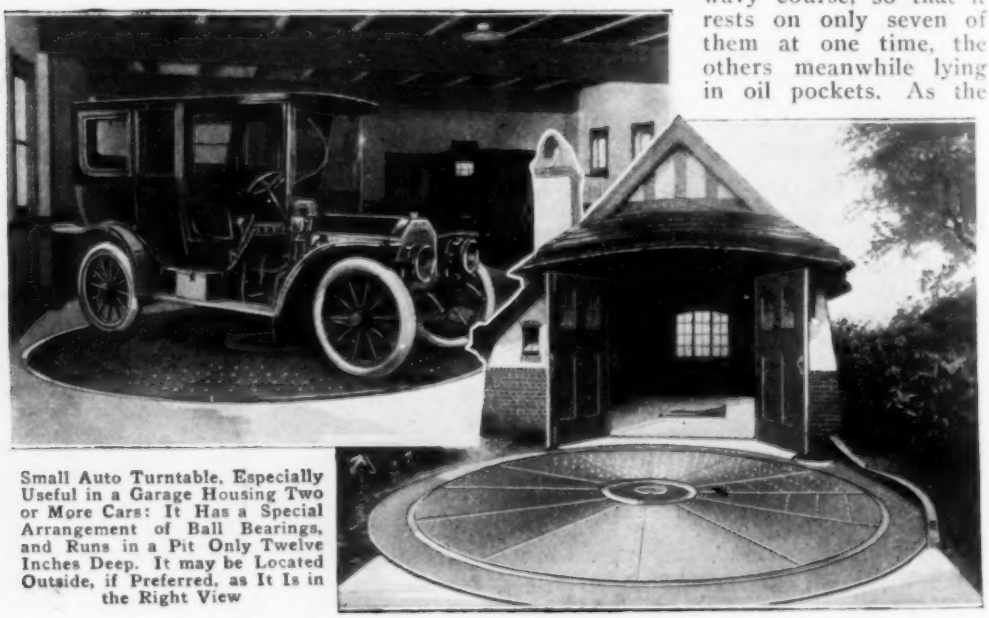
The "Occupation of Acquiring" Involves the Boys and Girls in Many Handicrafts and Avocations, When Study Hours Are Past

so on for the other seven, which are named, suggestively enough, the occupations of congregating, languaging, cosmologizing, man-conserving, pairing, and acquiring possessions. In all of these the child is graded on the basis of his own best work.

This last occupation involves the child in the most interesting phase of the whole school work. Under the name of "projects" are included a dozen activities, most of them rewarded by money wages, all carried on after study hours, and all accentuating individual initiative and efficiency. Prominent among the projects are the Automotive Research Laboratory which is now noisy with the construction of a full-size airplane, the Printing Company which handles all the school's printing, and the Repair Company which does the odd jobs. The Paper-Baling Company, the Messenger Service, and the Secretarial Division are among a dozen others. Finally, there is the bank, which finances all these miniature industries, besides handling 95 checking and saving accounts.

SMALL GARAGE TURNTABLE ON BALL BEARINGS

Private garages in narrow quarters offer a problem every time the car is moved, further complicated when two or more cars are kept in a restricted space. With an easily rotated turntable, located either inside or just outside the door, the difficulty is removed. A substantial model made by an Ohio firm needs a pit only 12 in. deep. The table turns on 84 two-inch steel balls, but they roll over a peculiar wavy course, so that it rests on only seven of them at one time, the others meanwhile lying in oil pockets. As the

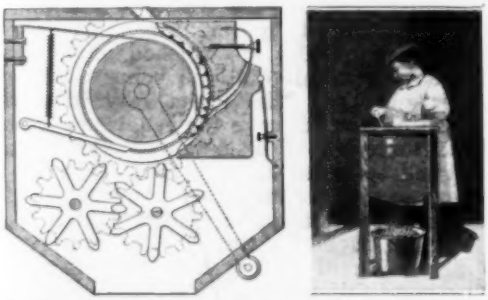


Small Auto Turntable, Especially Useful in a Garage Housing Two or More Cars: It Has a Special Arrangement of Ball Bearings, and Runs in a Pit Only Twelve Inches Deep. It may be Located Outside, if Preferred, as It Is in the Right View

table is rotated, the seven balls pass along and are replaced by others, affording an exceptionally easy movement. The table face is made of 12 sector-shaped steel plates on steel trusses, with a concrete rim and an iron center. Casters support the edge while the car is rolled onto it.

GREEN-PEA HULLING MACHINE OPERATED BY CRANK

Green peas can be hulled at an extremely rapid rate by a recently patented machine, according to the inventor. The contrivance is designed to be operated by a crank, and is intended for use in hotels, restaurants, or canneries. Filled pods are fed into the device through a slanting hole in the top of the wooden mechanism case, and are carried by a toothed wheel over two splitting knives. After being removed from this wheel by a scraper, the split pods drop between two meshed paddle wheels, which revolve in opposite directions. The effect of the paddle wheels



At the Left can be Seen the Interior Arrangement of the New Green-Pea Hulling Machine. On the Right, the Device Is in Operation

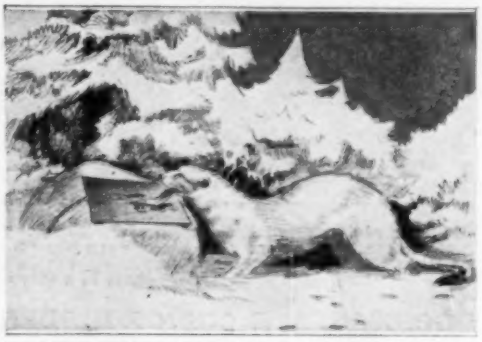
is to shake the peas out of the pods. Hulled peas and their former coverings are discharged through an opening in the bottom of the case.

OLDEST EXPERIMENTAL FIELD ON UNIVERSITY CAMPUS

Agriculturists of the state university at Urbana, Ill., point to a plot of ground on the campus not far from the college buildings as the oldest soil-experiment field in the United States. Since 1879 these acres have been under scientific cultivation and expert scrutiny. Every year for 40 years, one section of the land has grown corn; on another, corn and oats have alternated, and on a third, corn, oats, and clover have been raised in rotation. An adjoining tract has for 24 years been subjected to a five-crop rotation test.

ERMINE CAUGHT BY ESKIMOS IN SIMPLE TRAP

In the wilds of northern Alaska, where extremely low temperatures are com-



Ermine Trapping: The Animal's Tongue is Frozen to a Piece of Metal or a Stone When It Attempts to Eat a Strip of Meat

mon, Eskimos employ an unusual, though very simple, method of capturing ermine, according to a school teacher who returned recently from that region. A thin strip of meat is placed on a smooth stone or piece of metal. When an ermine attempts to eat this bait, its tongue touches the object on which the meat rests, and is frozen fast.

SHOTS FROM PISTOL STOPPED BY GLASS TWELVE FEET AWAY

Bullet-proof glass is an interesting and valuable development of the unbreakable glass so much used in goggles, windshields, and airplane windows. This latter substance is formed of three plies, the inner being of unshatterable celluloid. And, although no details were divulged at the time of the tests in the armory of the 69th Regiment, N. Y. N. G., it is commonly surmised that the composition of the bullet-proof material is similar. In the course of these military tests the sheet of the glass in the photograph was subjected to the fire of an army "45" at a distance of only 12 ft. Each time the outer ply of glass was shattered, but it always stayed in place, and stopped the bullet.

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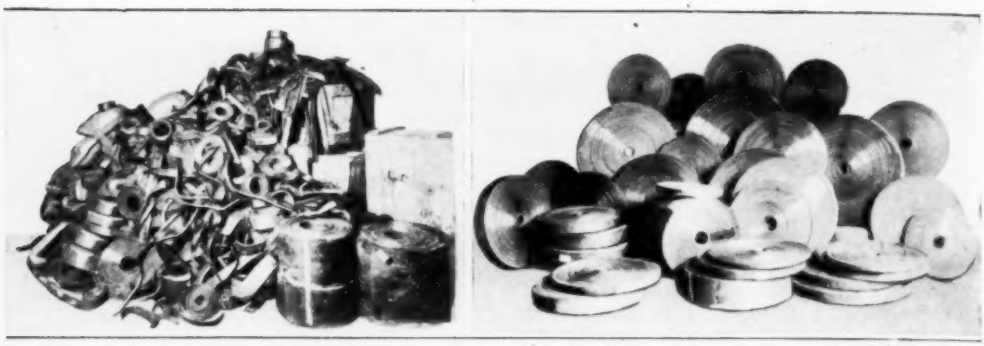
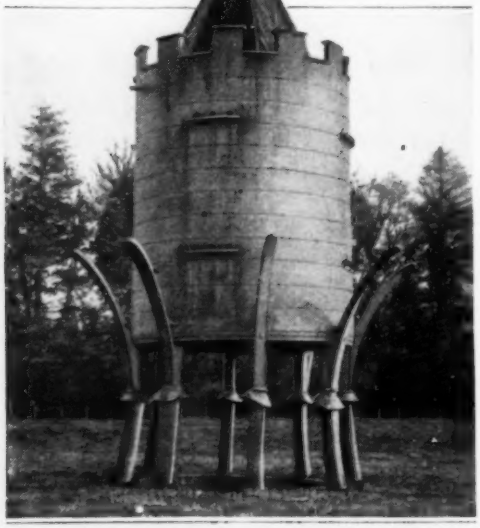


Old Leather Machine Belts, Prepared for Further Service by Means of Chemical Baths, can be Seen at the Right in the Illustration. The Baths Vary According to the Requirements of the Material, There Being One for Belts Used in Cement Factories; Another is Intended to Rejuvenate Leather Damaged by Water. On the Left Is a Pile of Untreated Material

DOORN-ESTATE CURIOS HIDDEN BY NEW TENANT'S WALL

Holland's unbidden guest, William Hohenzollern from Berlin, new tenant of the ancient house of Doorn, has walled in the great estate with a 10-ft. barrier, and the curios that beautify the park no longer delight the eye of the passer-by. Typical of the collection of bizarre



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A Curious Pagoda on the Doorn Estate in Holland, Now Tenanted by the Former Emperor of Germany: The "Tower of Doves," Mounted on Posts of Solid Whalebone

structures among the trees is the "Tower of Doves." This big cylindrical bird shelter is supported by eight huge curved posts of solid whalebone, the relic, no doubt, of some former master's prowess on the sea.

CHEMICAL BATHS REJUVENATE OLD MACHINE BELTS

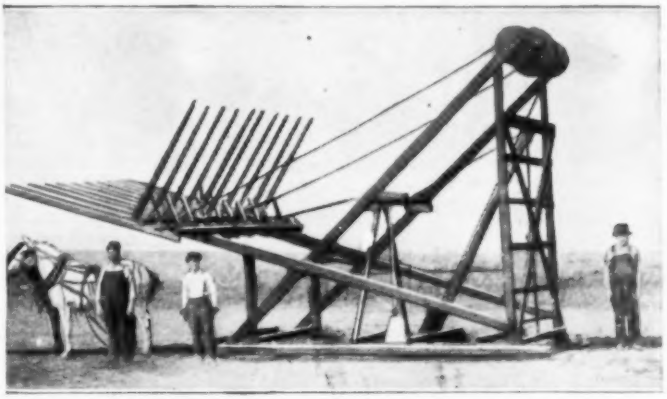
Apparently worthless leather machine belts are restored to serviceable condition in a novel plant now operating in a mid-western city. This result is accomplished by a process which is similar to that employed by laundries. In other words, the belts are washed, eight different chemical solutions being used for this purpose. The baths vary in composition according to the requirements of the material. For example, one is designed to renovate belts that have been used in cement factories. Another is intended to rejuvenate leather which has been damaged by water. The extremely high price of belting has induced many users of this commodity to patronize the new industry.

OLD NOTIONS UPSET BY TESTS OF BLINDFOLDED PEDESTRIANS

Attempting to refute the old notions that a blindfolded person walks in circles because one leg is longer than the other, because the walker is right-handed, etc., a southern professor reports a number of experiments performed in a field near Knoxville, Tenn. More than 50 men, women, and children were blindfolded and told to walk straight ahead. The surprising results may be summarized thus: The same person would walk sometimes in a right-handed circle, sometimes in a left-handed one. Every one walked in a practically perfect circle, of diameter varying from 100 paces for adults, to 20 for children. The less the subject thought of his walking, or tried to control it, the more perfect the circle.

STACKING MACHINE HANDLES HEAVY LOADS OF HAY

Handling loads weighing over one-half ton, a hay-stacking machine invented by a Nebraskan is capable of placing material on a pile 20 ft. in height. Two long arms, pivoted near the bottom of a triangular frame, are equipped with two sets of tines, one rigidly attached, and the other arranged so that it can be swung with a sliding bar. Hay placed on the first set of tines is held by the second. Wire cables, running over pulleys on top of the frame, are employed to elevate the arms. When the latter are in a vertical position, the movable tines are released, permitting the load to slide off and fall on the stack. A team of horses or a tractor may be used to operate the device which, in simple form without winding drums, requires merely a straight pull on the cables.



Half-Ton Loads of Hay can be Elevated and Stacked by This Contrivance, the Invention of a Nebraskan. Two Horses or a Tractor will Operate the Machine

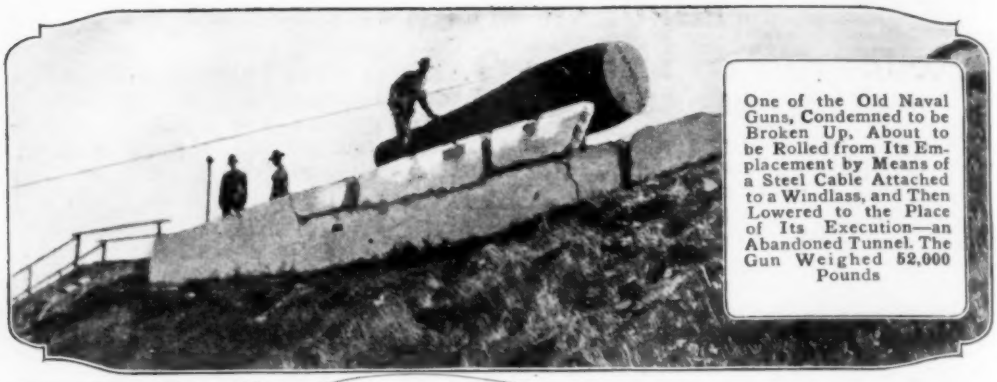
TENT, AS USEFUL TRUCK BODY, ADVERTISES OWNER'S WARES

An Oklahoma maker of tents and awnings is combining utility with his advertising by using a sample tent as the body of his light motor truck. The heavy-duck inclosure is 7 by 12 ft., by 8 ft. high, and has a window in each side. This simple arrangement not only calls attention to the owner's wares, but serves, as well as a more elaborate and expensive body, to protect goods in transit. Furthermore, the tent maker, who is an ardent sportsman, can convert the whole truck into a camping outfit in a few minutes, merely by packing in a cot, provisions, and cooking apparatus, thus supplementing business with recreation on short notice in the most modern and efficient manner.

The Tent Maker's Canvas Truck Body, a Three-in-One Contrivance That Advertises His Goods, Protects Them in Delivery, and Serves as a Fishing Camp

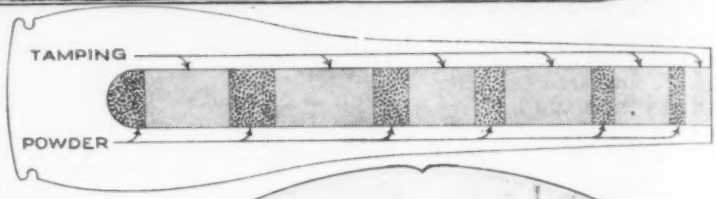
TALKING MACHINES ON SHIPS ADVERTISE BUILDERS

Every vessel constructed in an eastern shipyard is supplied with a phonograph, donated by the building company, and placed on board before the craft is delivered to the purchaser. The machine is not exclusively intended to be used for entertainment, as might be supposed, but is installed to serve as an advertisement. Accompanying each device are three records, on which are inscribed a history of the shipbuilding concern, a description of the methods employed in producing steel boats, and other similar facts. One record is in English, another in French, and a third in Spanish. Ordinary records can, of course, be reproduced by the phonographs, which are of standard design.



One of the Old Naval Guns, Condemned to be Broken Up, About to be Rolled from Its Emplacement by Means of a Steel Cable Attached to a Windlass, and Then Lowered to the Place of Its Execution—an Abandoned Tunnel. The Gun Weighed 52,000 Pounds

The Barrels of the Old Guns were Loaded with Dynamite in Layers from Breech to Muzzle, Tamped Down by Thick Layers of Clay between the Charges. The Sketch at the Right Shows the Arrangement



The Fragments Which Look So Much like Building Stone Are the Pieces of the 17 Guns, Reduced to Scrap and Ready for Shipment

The First Gun to be Rolled Down the Terrace is Seen Lying in the Cut Leading to the Mouth of the Tunnel, Which Yawns in the Background. The Next Step Was to Get It into the Tunnel

The Blasting of the First Gun Was Largely Experimental, and the Resulting Fragments Were Rather Large. Heavier Charges were Used Later

Breaking Up the Guns Incidentally Nearly Wrecked the Tunnel. The Walls Were Intact before the Blasting

WRECKING OLD NAVAL GUNS WITH DYNAMITE

By JOHN EDWIN HOGG

WHAT to do with 17 antiquated 15-in. guns, at the military post on Alcatraz Island in San Francisco Bay, which had outlived their usefulness, was the problem that confronted the War Department recently. The guns, cast in 1862, were of an obselete smooth-bore type, known as "Rodman rifles," and could be used only for firing round shot. As each gun weighed 52,000 lb., the task of removing them from the island intact would have involved operations more costly than their value as old metal. Cutting up the old cannon with acetylene torches was suggested, but, after a trial, was found impracticable. Exploding the guns appeared to be the only remaining alternative, but to do this without wrecking the buildings on the island or losing the gun metal, appeared impossible.

Leading away from the power house which supplies electricity to the military post and the Federal prison on the island, there was an old tunnel, once used as an aqueduct and power conduit, but for the past ten years abandoned. This tunnel was stripped of its fittings. Then a corps of carpenters went in and lined the hole —top, sides, and bottom—with 6 by 6-in. timbers.

One of the guns was jacked out of its emplacement, and rolled into the tunnel. Here 100 lb. of 70-per-cent dynamite was loaded into the breech. This was tamped down with 26 in. of clay. Another charge of 75 lb. of 70-per-cent dynamite was then placed on top of the first, and tamped down with more clay. The dynamite and clay were then tapered down to the muzzle with a third load of 75 lb. of dynamite; then loads of 50, 40, and 30 lb., respectively, until, in all, 370 lb. had been stuffed into the gun. A final muzzle seal of clay and white lead closed the mouth of the cannon. Meanwhile, to protect the island power house, the carpenters had constructed a barricade of 6 by 6-in. timbers about 100 ft. from the mouth of the tunnel, which happened to be in a direct line with that building. An ignition wire was strung from the gun to a safe distance away from the side of the tunnel, and when all was ready, the handle of the blasting machine was shoved down.

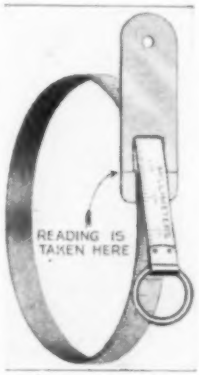
The explosion that followed was terrific. Alcatraz Island and all of San Francisco trembled. Every window in the power house and other near-by buildings was shattered. When the engineers went into the tunnel, after the smoke and dust had cleared away, all that was to be found were scraps of the gun, splinters of the planks that had lined the tunnel, and tons of loose rock that had formerly been the tunnel wall. When the débris was all cleaned out, the biggest piece of the gun that could be found weighed 840 pounds.

Profiting by the experience gained in the shattering of the first gun, heavier charges of dynamite were placed in the breech of the next one. The second gun was reduced to bits, the largest of which weighed only 360 lb. The third gun was broken into portions all under 300 lb., and the remaining 14 were reduced to fragments of less than 290-lb. weight.

With the completion of the blasting operations, there was little difficulty in collecting the remnants of the old guns. The metal was then transferred to the hold of a vessel and shipped by way of Panama to the Atlantic coast. In an eastern arsenal these old cannon, which "did their bit" in the Civil War, will be melted up and recast into modern harbor-defense mortars, or possibly into high-power naval guns to bristle from the turrets of one of our best and newest fighting ships.

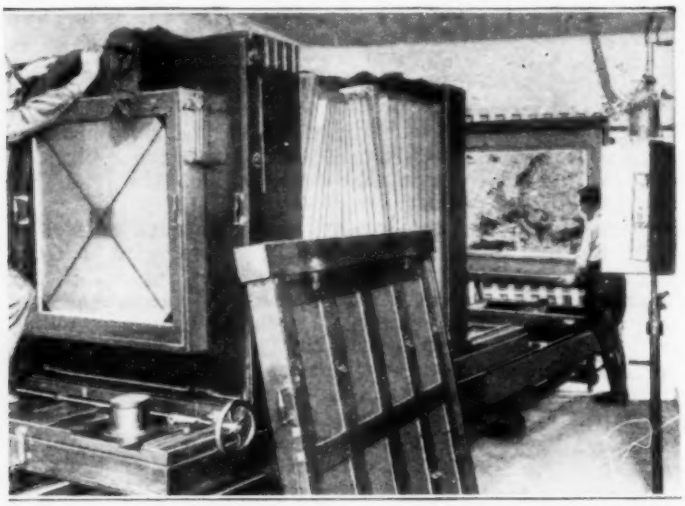
PISTON-RING DIAMETER FOUND BY CIRCUMFERENCE GAUGE

Diameter is found by utilizing circumference, in a new piston-ring gauge of English make. It is simply a short steel tape measure, with one end passed through a slot in the other, making a circular loop. The slotted end is broadened, and is screwed to the bench. The piston ring to be measured is inserted in the loop, and the free end of the gauge pulled tight. It is graduated in millimeters, 50 to 150, and indicates the exact diameter without computation. The instrument obviously might be used for measuring other cylindrical bodies.



BUSY MAP MAKERS IN FRANCE WATCH PEACE CONFERENCE

Every time the peace conference changes the status of a European nation, there is a call for new maps. The past year's acceleration in the making of history has kept the map printers of France exceptionally busy, for every new drawing is a "rush job." Copies are made by the photographic process. The enormous camera used has bellows, ground glass, and all the other familiar parts of a common studio instrument, but on a greatly exaggerated scale. The plate holder alone is so big that it requires two men to lift it into place. Electric lights are used with special reflectors.



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The Huge Photographic Apparatus of the French Map Makers: The Enormous Plate Holder is Leaning against the Base

AMERICAN SHIPS NOW CARRY HALF OF NATION'S EXPORTS

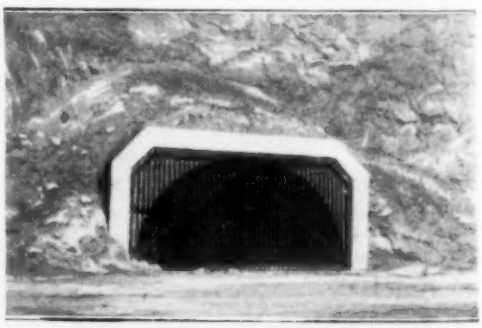
American ships soon will be carrying more than one-half of the exports from this country, whereas, before the war, only one-tenth was transported by vessels flying the Stars and Stripes. Recently compiled statistics show that at present 45 per cent of the outgoing goods are conveyed in domestic-owned bottoms, and indicate that in the near future this figure will be increased to 60 per cent. A year ago, only 23.3 per cent of the cargoes sent from the United States left port in American boats, while 39.9 per cent were transported in British ships. The latter are now carrying only 32.8 per cent of the total amount.

SECRET COPPER-ZINC ALLOY STRONGER THAN STEEL

Extraordinary claims are made for a new alloy of copper and zinc, discovered by an Italian engineer, around whose secret formula a large manufacturing enterprise has been organized. The new metal is asserted to have higher breaking point and elastic limit than other metals of its class, to resist corrosion and heat, and to have a perfectly uniform structure. In comparative tests, a tensile strength of 1,100 lb. was shown by a rod only ¼ in. in diameter, and weighing but 3 oz. to the foot. The new metal may be cast or forged, and meets all requirements for machine working. By slightly altering its composition, it becomes adaptable as a substitute for steel, brass, or aluminum. It has been found very useful in the construction of new air and water craft.

HOUSE OWNER TUNNELS HILL TO GAIN ACCESS TO STREET

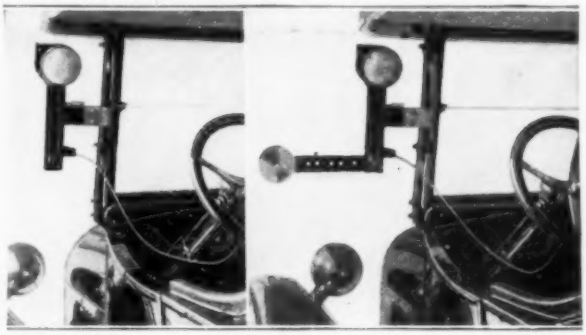
Reminiscent of the olden days when the underground passage was a part of every castle, is the tunnel which approaches a residence in a western city. This gallery, however, is built solely to make the house more accessible from the street, from which it is separated by an abrupt hillock.



This Is Not the Grated Entrance to a Catacomb, but to a Tunnel Which Connects a City House with the Street. It Pierces a Hillock That Formerly Made the House Almost Inaccessible

WHIRLING AUTO SIGNAL WARNS OF STOP OR TURN

Among the many signaling mechanisms now sold as automobile accessories is one with several clever features. Resembling roughly a railway-semaphore arm, it is clamped with its receiver to the windshield frame. On approaching a turn or stop, the autoist extends the arm by means of a lever at the steering wheel. The little signal arm then displays at its outer end two fans which are whirled about by the wind. As they revolve past each other they make a signal which inevitably attracts the eye of a motorist in the rear. A small electric bulb is lighted between the fans at night, and gives intermittent flashes that are even more conspicuous. The fans are normally held behind the mirror.



The Whirling Signal is Normally Held behind the Mirror, as Shown at the Left. Approaching a Turn, the Driver Presses a Lever, and the Arm Falls into View

GENERAL PERSHING PRESENTED WITH COSTLY SWORD

Probably the most costly token of appreciation received by Gen. John J. Pershing, commander of the American Expeditionary Forces during the war, is a sword and scabbard, presented recently by the people of Missouri, his native state. Green gold, carved to represent a laurel wreath, forms the sheath, which is encircled with bands of yellow gold, inscribed with the great leader's military record. Four platinum stars, set with diamonds, the state seal of Missouri, and an appropriate inscription further embellish the scabbard. Precious stones stud the gold hilt of the weapon, while the blade is elaborately etched. The value of the sword is nearly ten thousand dollars.

General Pershing's Sword: The Weapon is Sheathed in a Gold Scabbard. Precious Stones are Set in the Latter, and in the Hilt. It was Presented by the People of His Native State, Missouri

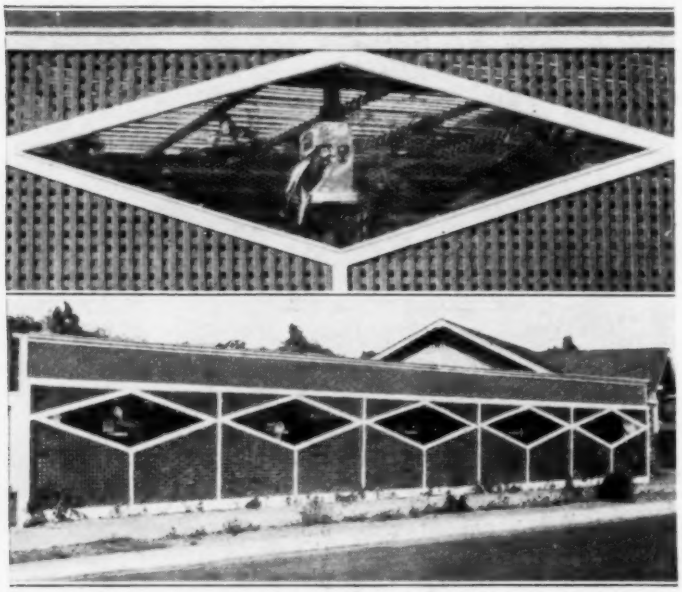
ELECTRIC HEATER DISTILLS GASOLINE FOR TEST

Designed primarily for testing gasoline by distillation, a novel electric heater of small size now on the market will find many other laboratory uses. The helix of heating wire is arranged as a cone-shaped coil in a conical recess in a block of insulation, and the recess is closed by a disk of fireproof material with a 1¼-in. center hole. An adjustable rheostat is included in the case, which has mountings to fit a laboratory retort stand. The flask of gasoline, or other test fluid, is supported over the 1¼-in. hole, which gives out intense heat without danger of breakage, and allows a perfectly controlled test. The efficiency and convenience of the apparatus greatly accelerate the process.

The Method of Using the Heater is Seen at the Left, the Sectional View of the Instrument at the Right Revealing Its Construction

AVIARY LATTICE CUT TO FORM SIDEWALK DISPLAY

By cutting large openings in the latticework, then perching a bird in the center of each, a bird dealer in a western city has transformed the high street wall of his aviary into an arresting sidewalk display. From a distance, the eye is attracted by the pleasant harmony of white trimmings and dark-green lattice; on nearer approach, the attention is caught by the brilliant plumage of macaws, cockatoos, and other fancy birds, each outlined against its white-backed perch. Only on close inspection are the openings seen to be covered by chicken wire, blackened to make it almost invisible. The whole scheme is attractively original.



The Street Frontage of the Aviary has been Cut to Give Passers-By a View of the Feathered Stock Within. One of the Lattice Apertures is Shown in More Detail Above

COLORED CORE CONSTITUTES TRADE-MARK FOR ROPE

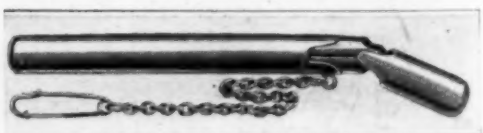
Rope and cordage are difficult commodities to trade-mark, as it has been held that colors or pattern in the strands, being part of the rope itself, will not afford legal protection. An Ohio manufacturer now makes ropes with a colored core or heart, separate from the strands but woven in when the rope is spun. This distinctive thread, observable by twisting the strands apart, is the trade-mark.

PRESERVE SOAP BUBBLES LONG IN SURFACE-TENSION STUDY

Soap bubbles, most fragile of childhood's playthings and traditional symbol of evanescence, take on new strength and character in the hands of science. Their almost dimensionless film offers unequaled opportunity for the laboratory study of surface tension and molecular action. In a course of experiments recently conducted by a scientist who has devoted many years to the subject, the bubbles were blown in air carefully filtered to exclude all dust and contamination, and shielded by a glass cover. They ranged in size from about 4 to 16 in., some hanging from the blowing tube and some resting on iron rings. One bubble kept in water-saturated air lasted 322 days, and then did not burst, but shrunk to a flat film by the gradual escape of air through its sides. The colors of light interference change as evaporation and drainage reduce the film, and at the thinnest stage it is black. Even then, however, the bubble supports a drop of water several times its own weight.

CLINICAL-THERMOMETER CASE HAS UNLOSABLE CAP

Particularly interesting to physicians and nurses is a new clinical-thermometer case, which is equipped with an unlosable cap. Pivoted on an extension sleeve, the latter can be pulled away from the case and swung to one side, permitting the removal of the instrument, but cannot be entirely detached. The device can be fastened to the clothing with a chain and safety pin.



The Pivoted Cap of This Novel Clinical-Thermometer Case, Which was Placed on the Market a Short Time Ago, cannot be Lost

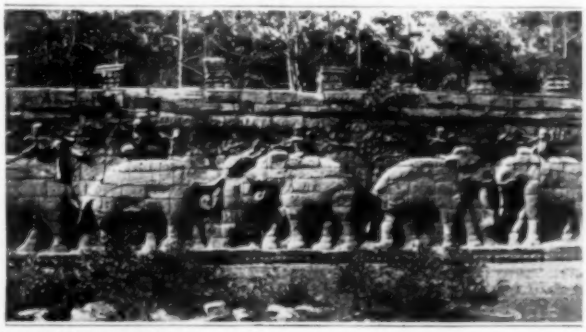
THOUSAND-YEAR-OLD FAR-EAST CITY BEING RESTORED

By FRANCIS DICKIE

THE ending of the great World War now permits the resumption of a most interesting archæological work, undertaken by the French colonial authorities, in Cambodia, Indo-China. Unknown and unheard of by the world at large—owing as much to the remoteness of the place from regular routes of tourist travel as to French reserve and shunning of publicity—the work aims at the reclamation of the ancient city of Angkor-Thom from the destructive invasion of the jungle, and the restoration of its strange architectural masterpieces.

One of the Five Colossal Gates to the Ancient City of Angkor-Thom, Indo-China, Deserted for Over 600 Years, and Now being Restored by the French

A thousand years ago, as the capital of the flourishing Khmer Empire, it was rich in imposing buildings and magnificent temples, ornamented with bas-reliefs, exhibiting wonderful skill. The city is surrounded by a wide moat, flanked by an enormously thick defensive wall, upon the top of which two automobiles could be run abreast. Entrance is by five colossal gates, surmounted by towers. On each of the four sides of the towers are sculptured human heads, their faces expressing the placidity typical of the statuary of Buddha. Angkor-Thom was captured and looted by the Siamese in 1373, and from that day was neglected until the French gained control of the country. In the very center of the city is the Bayon temple, built on terraces that were reared by the labor of countless thousands of men on the flat plain. Near it the remains of the king's palace stand on another terrace. Upon the facings of this latter elevation are sculptured processions of elephants, extending a distance of a quarter of a mile, one of the most difficult artistic feats, in that each stone making up the carving was cut separately and fitted in. Yet there is no loss of line shown or discrepancy in any way.



PHOTOS BY FRANK BURNETT

Procession of Elephants on the Facings of the Terrace, upon Which Stand the Ruins of the King's Palace: This Bas-Relief, Extends for a Quarter of a Mile, Each of the Blocks of Which It is Composed being Carved Separately and Fitted with Infinite Care, So as Not to Mar the Perfection of the Sculpture

But none of the city's structures approaches in size or beauty the temple of Angkor-Vat standing about a mile from the city. This noblest monument of the ancient civilization is constructed entirely of a fine-grained sandstone, brought from quarries 15 miles away. How the huge blocks—many of them weighing tons—were moved and, greater puzzle still, how they were brought into place, will always remain a mystery. The temple took 300 years to build and was just completed in 1373 when the Siamese looted the place; from that time on, this labor of centuries was left to erosion and decay until the coming of the French. The chief entrance to the temple is on the west. A flagged high-

way leads across a very wide moat to a great outer colonnaded gallery, 900 ft. in

Ruins of the Temple of Angkor-Vat, Considered the Most Magnificent Example of Khmer Architecture

length. Into this, five doors open, set high and reached by steps. At regular intervals in this gallery are gigantic stone representatives of different Hindu deities. One of them, a six-armed statue, was visited by countless childless women come to propitiate the god with offerings of their hair, in the hope that the god would grant them a child.

PHOTOS BY FRANK BURNETT

Flagged Road Leading to Chief Entrance of Angkor-Vat: In the Colonnade, Which Is 900 Feet in Length, Are Gigantic Images of Hindu Idols

Passing through the central doorway, the temple visitor comes upon another broad flagged road, which leads to the main building, a quarter of a mile away. Some idea of the millions upon millions of feet that have trod this highway may be gained, when it is stated that here and there deep grooves have been worn in the surface by the mere action of bare feet. This roadway is bordered with tanks along which run stone balustrades representing the king Cobra.

Inside the gallery is a courtyard from which rise three terraces, surrounded by other colonnaded galleries and cloisters, all a mass of sculpture, the last one being reached by a stairway 40 ft. in height, on which rises the Preasat, the great tower whose summit overlooks the first wall of Angkor-Thom from a height of 250 feet.

With the passing of the Khmer Empire the jungle growth slowly encroached upon the city, and the temple of Angkor-Vat The banyan tree and lesser vegetation took root on top of the walls and gradually penetrated the interstices of the unmortared stones. In this way parts of standing walls were forced out and slowly broken down. The great balustrade of the king Cobra was completely overgrown.

Not understanding the construction of arches as built at present, the ancient architects formed them from overlaid massive blocks of stone, the one fitted into the other. These archways above the colonnades, by their tremendous weight, slowly forced out the columns at the top, and the erosion of the rain beating on the columns' base loosened them at this point. The French built a good road through the jungle from the present-day village Siem-Reap, and cleared away the trees and shrubbery from the principal buildings. Through those of the columns which had been pushed outward, iron rods were driven and the columns drawn back in place, the end of the rods being secured to the wall at the back. Crumbling towers are being shored up with iron rods and cement. The bottoms of the columns in the galleries have also been strengthened by cementing, and columns that were utterly destroyed have been replaced. Dozens of fallen and

broken statues were raised, cemented or bolted together, and replaced in their former position. One of these, a six-armed statue, is an example of what has been done in the way of rehabilitation. The statue was broken in three places, and the arms were off when the restoration work was begun by the French. As it stands now, it shows but little evidence of these misfortunes.

Civilizations flourish, fade, and pass. Countless wonders of the ancients have been lost to the present-day view by neglect and destruction of unthinking men. In saving the wonderful remains of the city of Angkor-Thom and the temple of Angkor-Vat, the French have again evinced their cultural interest and put humanity under obligation.

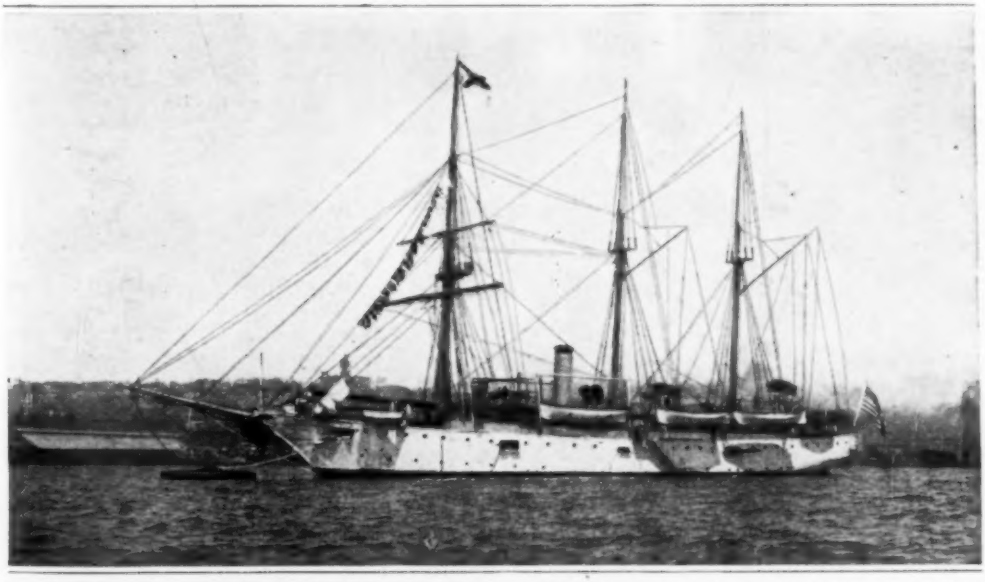
Inner Causeway beyond the Colonnade Shown on the Opposite Page: This Leads to the Main Temple Building, Which Consists of Three Stages with Numerous Exterior Staircases Culminating in the Sanctuary, the Great Pyramidal Tower in the Center

STATE TRAINS MERCHANT SAILORS

By LAWRENCE WILLIAM PEDROSE

BY a recent act of the Washington State Legislature, the young men of the Northwest are given the opportunity of becoming commissioned officers in the merchant marine through instruction and practical training given at the nautical school established at the state university. Everything that should be known about navigating a ship on the high seas—marine engineering, the storage and unloading of cargo, and all the intricate details essential to the operation of vessels—will be taught by competent men who have had years of experience in the navy and in the merchant marine.

The course of instruction covers two



United States Ship "Vicksburg," Assigned to the Merchant-Marine School on the Pacific, for Use in Training Officers for the Rapidly Growing Fleet of American Merchant Vessels

years, and cruises to foreign shores of several months' duration are included in the curriculum, as well as vacation periods during which instruction will be combined with recreation and adventure.

The state pays for the board and education of the young men who enter the service, and the Federal government contributes an annual amount equal to that appropriated by the state legislature.

To be eligible for admission, applicants must be between the ages of 17 and 21. They must have a grammar-school education, and one year of high school is preferred, though not necessary. The applicant must pass a mental examination in arithmetic, elementary algebra, American history, geography, grammar, and spelling. His parents or guardian must be American citizens.

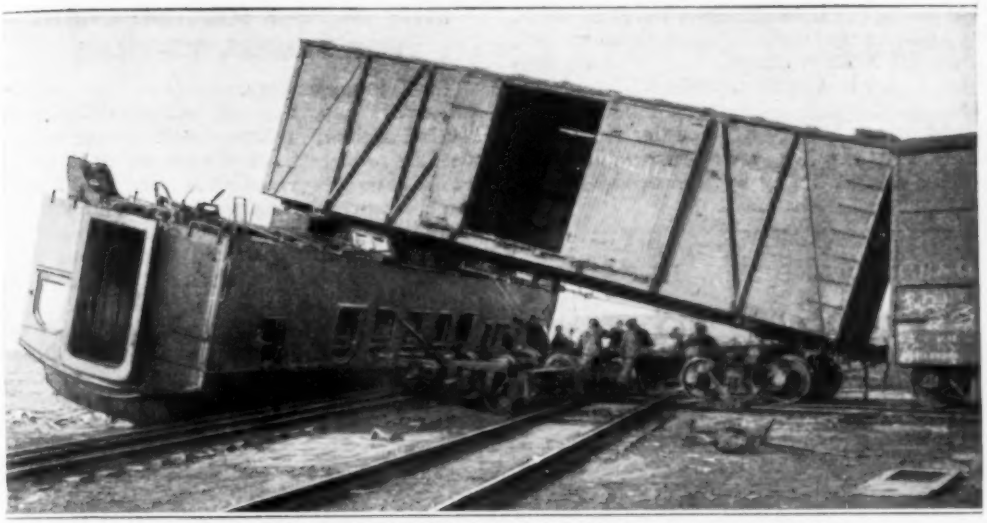
After his two years' course, the young man who is graduated from this western Annapolis will be fitted to step aboard the finest vessels of America's business fleets and obtain a position paying at least $160 a month and all found.

The nautical school is not a military institution, but is intended for fitting young men as officers of merchant vessels. Because of the rapid growth of the American merchant marine in the last few years, and the prospect of its growing with even greater rapidity in the near future, the government has recognized the need for a large number of specially trained and educated officers to man these vessels. It is expected that the demand will be met by the establishment of nautical schools at various seaports.

ANALYSIS DETECTS BLOWN-OUT SHOTS IN MINES

One of the causes of coal-mine explosions is the occasional action of a charge of blasting compound in firing like a gun, without breaking down the walls of its hole. This is called a blown-out charge. Experiments by the Bureau of Mines have shown that half a pound of material collected by scraping a hole will reveal, when analyzed, whether a shot has been fired in the hole, and even tell the nature of the explosive by comparison with neighboring coal. This determination is useful in investigating disasters.

The Merchant Mariners must be Sailors Before They Are Officers, and the Students of Washington State's Nautical School are Learning Ships from Bowsprit to Rudder, with Many a "Heave Ho"



DINING CAR OVERTURNED BY FREIGHT CAR IN COLLISION

RAILROAD accidents sometimes produce strange wrecks. To illustrate this assertion can be cited a collision that occurred recently at Denver, Colo., where an empty freight car and a dining car came together at a track intersection, toward which both were being moved by switch engines. Little damage was done to the bodies of the cars, nor were serious injuries suffered by the four men in the dining car, though the latter was completely overturned as a consequence of the crash. A truck was torn from each car, and one end of the freight car was pushed over the dining car, by which it was supported in an elevated position. Two hours were required by a wrecking crew to clear the rails.

ARGENTINA PLANS MONSTER HYDROELECTRIC PLANT

Surpassing the Niagara Falls, in height by 50 ft. and in width by more than a thousand, a little known South American cataract tumbles toward the Atlantic Ocean, some 700 miles to the north of Buenos Aires. A greater volume of water flows over the North American drop; yet hydroelectric engineers of the Argentine Republic look to this fall in the Iguassu River for their deliverance from the international fear of coal shortage. Present plans call for one main and three emergency lines to the capital city, where the power will be sold in competition with the cheaper grades of coal. The initial development will cost from $30,000,000 to $40,000,000, and will yield about 150,000 hp., which, incidentally, is but a small fraction of the total available power.

HEAVY TANGLE OF OLD HEDGE CLEARED AWAY BY TRACTOR

Several weeks of hard labor seemed the only solution of a problem an Illinois baseball association set for itself when it decided to remove an old, tangled hedge

Method by Which a Farm Tractor, Operating like an Army Tank, and Assisted Only by a Chain and an Axman, Cleared Away a 15-Foot Hedge

that had grown to a height of 10 to 15 ft. around its grounds. As an experiment, however, a farm tractor was pressed into service, with a man to drive it, and another to manage a chain attached behind it and to chop away the heavier roots. In a few days the hedge was razed and completely cleared away by this novel means.

PICTURE SYMBOLIZES UNION OF OLD AND NEW IN CAIRO

The very spirit of modern Cairo has been caught in a photograph sent recently

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Turning Their Backs on Cairo, the Merchants Above are About to Cross the Nile Bridge to the Island of Gezira Bulak. The Lock Controls the Water Flow from the Ismailia Canal

from Egypt and reproduced on this page. Just as the tourist may drive in a few moments from his magnificent European hotel to the tortuous streets of the Arab quarter, or to the citadel with its northward view of the pyramids of Giza, so the eye meets here the old and new. Over the wooden drawbridge across the Ismailia canal passes a camel, piled high with native goods, and attended by merchants in robes and turbans; while in the foreground are seen the steel gates of a lock installed by British engineers.

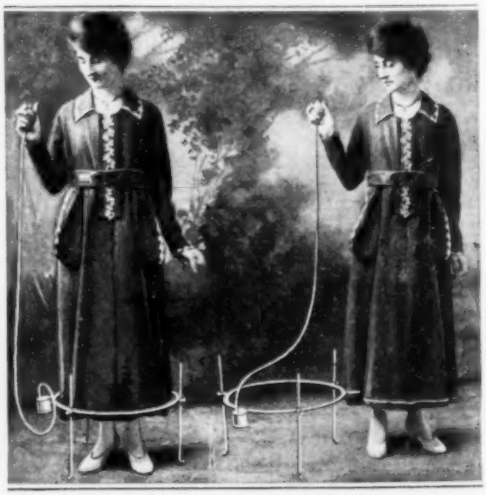
¶An immense concrete storage bin, capable of holding 400,000 tons of coal, is being constructed at Wilson, Pa., by a large steel company to hold an emergency supply of fuel. The great bin will be 600 ft. wide and 800 ft. long.

SHIP BUILDS HEATED CABIN FOR FROZEN TURTLES

Twelve passengers, the eldest said to be 490 years old, and all weighing around 300 lb., arrived in New York harbor a few weeks ago in a steam-heated cabin of their own. They were turtles, and had been placed in open tanks on the deck of a fruit steamer at Port Limon, Costa Rica, but as the boat progressed up the coast the breezes grew chilly, and the turtles lost their "pep." When off the Virginia coast they all relapsed in stonelike coma, and the ship's doctor prescribed warmth in large quantities. So the carpenters constructed a deck shelter aft, and packed it with steam pipes. The derrick man moved the passengers into their new quarters, the engineer turned on the steam, and in an hour the huge reptiles had revived.

BULB-OPERATED SKIRT MARKER FOR HOME DRESSMAKER

A skirt marker for the home dressmaker, designed to be operated by the wearer of the garment, has been patented by a western inventor. The device includes a tubular ring, mounted adjustably on legs, and equipped with a powder container, to which is attached a rubber tube, terminating in a bulb. To employ the contrivance, the manipulator stands inside the ring, and presses the bulb. Air pressure created in this way forces powder from a vent that extends around the inside of the ring, making a line on the skirt.



Standing inside the Ring, as at the Left, the Dressmaker Squeezes the Bulb. Powder is Forced from a Continuous Vent, Marking the Skirt, as at the Right

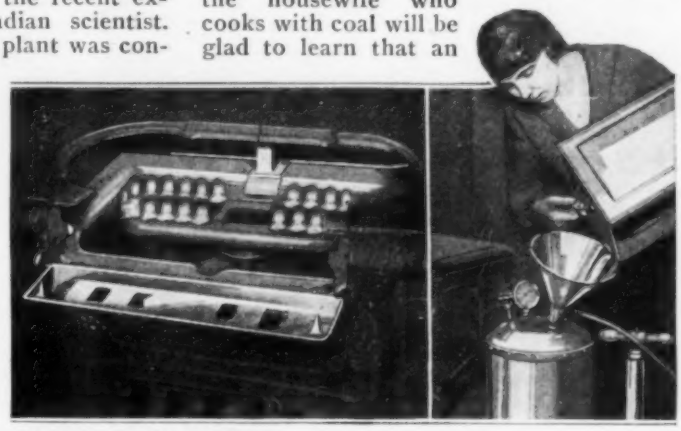
RADIO-ELECTRIC WAVES VARY GROWTH OF PLANT LIFE

That radio-electric waves have a positive influence on the rate of growth of plants is demonstrated by the recent experiments of an East Indian scientist. The upper part of a potted plant was connected with a wireless antenna, and the lower part of the stem grounded. A transmitter 650 ft. away sent out waves of short length, while the variations in the plant were measured by the movements of a spot of light on a screen, reflected from a small mirror on an extremely sensitive lever. It was shown that feeble electric waves accelerated the rate of growth of the plant, while stronger waves retarded it. A mimosa plant, used in the first experiment, was found to be exceptionally sensitive to the action of these radio-electric waves.

¶A post-war jump in circulation to home readers, and the extension of the shelves to accommodate the new total of 1,008,394 volumes, are the features of a recent report from Chicago's public-library board.

OIL BURNERS MADE FOR USE IN KITCHEN COAL RANGE

Remembering the alarming coal crisis through which this country lately passed, the housewife who cooks with coal will be glad to learn that an ingenious oil burner may now be bought and quickly slipped into her kitchen range. Fuel oil for the burner is kept at a safe distance from the stove, with which it is connected by a suitable hose. Air pressure, maintained by an occasional stroke on a hand pump, forces the kerosene through the hose and into the burner. This is placed in the unaltered fire box.



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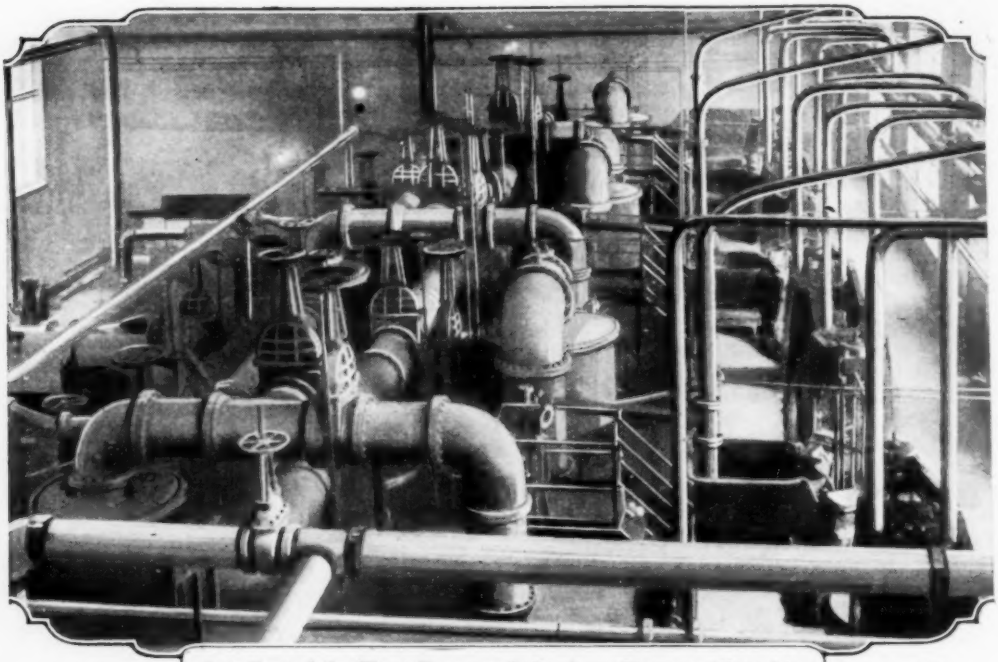
The Lids and Damper of the Kitchen Range have been Removed, at the Left, to Show How Simply the Burner is Installed. The Fuel is Stored in the Tank at the Right, and is Forced into the Burner by an Occasional Stroke on the Hand Pump

WATERPROOF SHELL IS USED IN NEW LIFE-LINE GUN

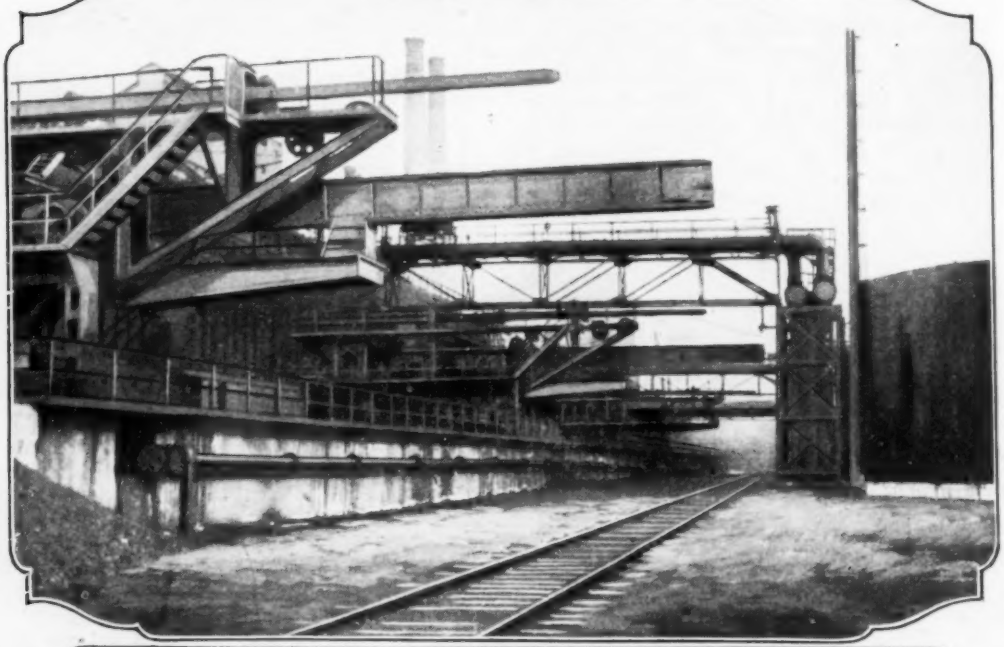
Firing a test shot with its barrel full of water was the unusual performance of an improved form of gun for shooting a life line over a wrecked vessel, in recent official trials. A one-piece shell containing powder and projectile gives the new gun a great advantage over the old muzzle-loading type. The barrel may be regulated by a pin on the carriage to elevations of 30, 45, 60 or 80°, and its range is 1,700 ft. The barrel is readily carried by one man, and the one-piece carriage has a pair of wheels for easy hauling. The firing mechanism is actuated by a lanyard, and the life line, attached to the projectile, unwinds from the center of the reel without kinking.

New Life-Line Gun with Knockdown Barrel, That Shoots Even When It Is Full of Water, and Never Kinks the Line

¶The noise of "piston slap," caused by the slight oscillation of a worn piston, has distressed many an auto driver, who was unable to locate the disturbance. A leading car maker, by the simple method of drilling the piston-pin hole a little off center, and so keeping the connecting-rod pressure always at one side, has effectually banished the trouble.



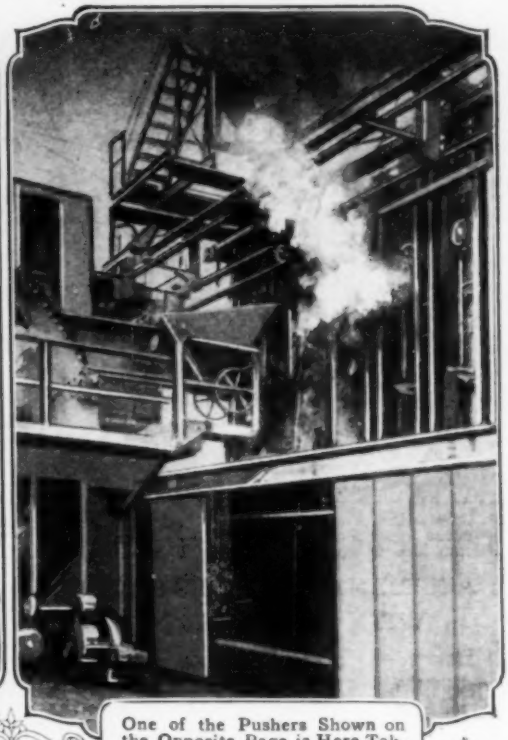
This Part of the Plant Recovers Daily, from Elements Wasted in the Old Process, 16,500,000 Cubic Feet of Illuminating Gas, 75,000 Pounds of Ammonium Sulphate, 24,000 Gallons of Tar, and 10,000 Gallons of Light Oil



After About 16 Hours' Burning, the Valve to the Gas-Collecting Main is Closed, the Oven-Charging Lids Removed, and the Doors at the Oven Ends Taken Off. A Pusher, like the One in the Foreground, Rolls along Its Rails into Position before the Oven Door; a Motor Rams the Huge Horizontal Arm through the Oven, and the Red-Hot Coke Tumbles into a Steel Car. These Machines are Also Used to Take Off the Brick-Lined Doors

OF OPERATION CHARACTERIZE MODERN COKE OVEN

After an Overhead Lorry has Filled the Oven, the Doors are Sealed. Then the Lids are Pushed over the Charging Holes, and the Gas-Collecting Valve Opened



One of the Pushers Shown on the Opposite Page is Here Taking Off an Oven Door. The Coke has been Burned, and is Now to be Quenched

Rammed Out of the Oven, the Flaming Coke is Carried in a Steel Car to the Quenching Station. Here the Nine-Ton Load is Run under a Shower Bath. After 30 Seconds of This Treatment, the Coke is Taken to This "Coke Wharf," Where It is Dumped

All the Metal Ornaments at the Left were Drawn with an Electric-Welding Arc, Bits of Metal being Carried from the Arc Electrode to the Metal Ground Plate by the Current, and Deposited Where the Operator Wanted Them. The Method of Working is Seen at the Right, the Object Being to Demonstrate Perfect Control

ACCIDENT PROVIDES SALMON WITH SECOND MOUTH

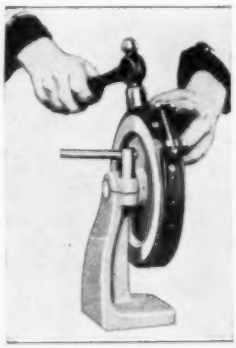
Regarded for a time as a unique freak of nature, a two-mouthed salmon, caught recently in a northwest - coast river, is now believed to have been furnished with a third jaw through an accident. The second mouth is located underneath the normal opening, and is separated from the latter by a thin jaw. One theory is that the fish was injured by a hook, which tore loose the cartilage that supports the tongue. This wound is supposed to have healed, forming the second mouth. The salmon evidently had control over the extra jaw, as a fish quickly dies when unable to close its mouth.

ORNAMENTS DRAWN WITH ARC SHOW CONTROL OF WELDER

To demonstrate the remarkable precision with which the modern electric-welding arc may be controlled, a large number of ornamental designs and objects have been built up of the molten metal deposited by the arc electrode. Each design is formed on a plate of metal, connected to one terminal of the welder. The metal is carried from the electrode to the plate in fused beads, and, using a small electrode and low current, the lines formed are fine enough for interesting work. The objects and patterns in relief are made by depositing one line of beads on another, gradually building up a wall or node of the desired height and shape.

TRANSMISSION-BAND ANVIL RESEMBLES WHEEL

Transmission bands used on certain light-weight motor cars can be relined without difficulty by employing a device now on the market. The contrivance comprises a wheellike anvil, mounted on a standard in such a way that it can be secured in different positions. Lining rivets are clinched by being driven against the surface of the anvil, when a band is bolted around the latter. The implement can be fastened to a bench or on the wall.



¶ Diamonds valued at $1,000,000,000, or about one-half of the world's stock, are owned by residents of the United States, according to recent estimates.

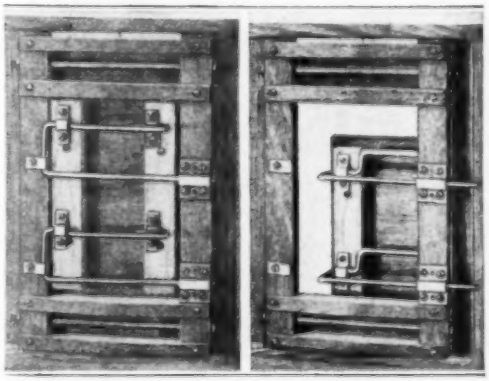
FIREWORKS BOMBARDMENT RIDS CITY OF BIRD PESTS

Without killing or maiming a single bird, the municipal authorities of Montclair, N. J., last year rid the locality of starlings and grackles, great flocks of which have invaded the city each fall, roosting in the trees along two fashionable streets, and disturbing the residents by their night cries. A proposal to frighten the birds away by shooting at them with firearms met with strong opposition. Among other schemes suggested was the use of fireworks. This plan met with general approval, and was finally adopted. A supply of Roman candles was obtained, and ten men, armed with these, bombarded the feathered pests. The treatment was administered on two successive nights, with the result that, on the third night, not one of the birds was to be seen in the neighborhood. The departure of the undesirable visitors was an extremely spectacular sight.

Chasing Birds Out of Montclair, New Jersey, with Fireworks: Roman Candles Served as Effectively as Guns, but did Not Kill or Injure the Pests

SILO-DOOR MOUNTING FORMS SLIDE, LOCK, AND LADDER

Simplicity is the essence of ingenuity. An Ohio inventor proves it by making a sliding silo door whose mounting combines slide, lock, and ladder, and still is less complex than any one of those attachments might be. U-shaped iron bars are so mounted that one leg turns in sockets on the door, while the other slides in mountings on the jamb. The bend of the U forms the lock. Released, the door drops down and inward, and may then be slid around inside the silo to a full opening. Closed, the bars are spaced to serve as the rungs of a ladder.



At the Left, the Door is Closed and Locked, Forming a Ladder. At the Right, It Is Partly Open

BABY-CARRIAGE WINDSHIELD IS ENGLISH INVENTION

From England, appropriately, comes an invention designed to protect the baby from rain and drizzle. Attached to the hood of a baby carriage, it takes the form of a transparent weather screen, or windshield, which is normally held on a roller. When its protection is desired, it is unwound from the roller and held by loops which slip over studs on the perambulator body.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

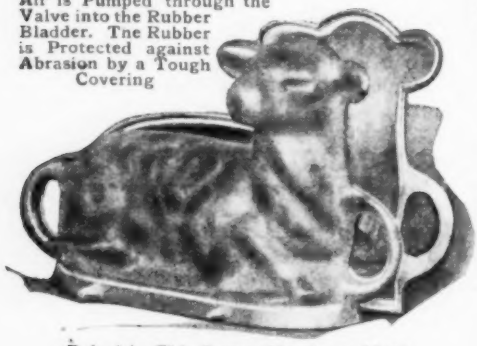
This Double Silver Spoon, One End for Tea and the Other for Coffee, can be Folded into the Leather Case for Traveling Use

By Pulling Off the Telescoping Case Seen Immediately Above, the Traveler Transforms His Stick into an Umbrella. The Case is Finished to Resemble Cane Wood

The Motorist's Lap Robe will Not Slip Untidily along the Robe Rail if These Two Steel Clamps Are in Place, One at Either End

This Boudoir Table is Conveniently Used for Breakfasting, as Shown. With the End Flaps Lifted, However, Deep Pockets are Uncovered, Making It Ideal for Sewing. The Central Section may be Tilted Back as a Bookrest

The Pneumatic Insole Makes Walking Easy. After the Shoe is Laced upon the Foot, Air is Pumped through the Valve into the Rubber Bladder. The Rubber is Protected against Abrasion by a Tough Covering



Baked in This Large Aluminum Mold, the Cake Takes the Form of a Recumbent Lamb. Removed from the Mold, Covered with White Frosting, and Sprinkled with Coconut, It Becomes an Odd Table Decoration

The Electric Fan Becomes More Desirable in the Home or Club, When Treated as in These Three Examples. The Reed Standards Suggest Coolness in Themselves. Designs may be Had, However, to Harmonize with Any Furnishings

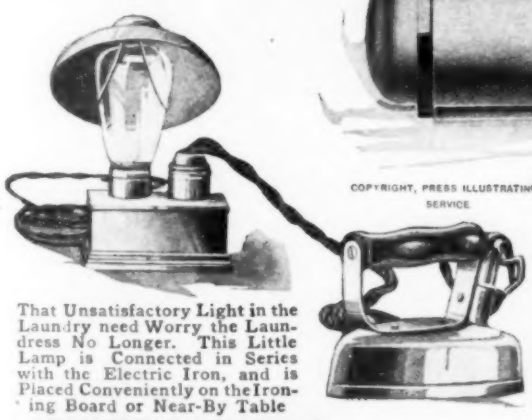
The Broom's Tendency to Wear More Rapidly on One Side, and at Last to Grow Generally Dishevelled, is Checked by This Spring Device Which is Clamped about It as Shown

The Grooves on the Inner Surfaces of the Jaws Assist the Pin to Hold the Clothes More Firmly to the Line, Than Does the Ordinary Pin

Reducing the Number of Bristles, and Arranging the Few Remaining as Shown, the Maker of This Toothbrush Claims a Better Cleansing of the Teeth

The Diminutive Oil Stove at the Right Burns Kerosene from the Tank at the Bottom. Forced into the Burners by Compressed Air, the Fuel Burns with a Hot and Odorless Flame. The Air Pressure is Maintained by the Occasional Use of a Small Pump. The Stove Finds Favor among Those Removed from City Gas Mains

The Use of Little Papier-Maché Cups like the One in the Uppermost Photograph, Lengthens the Life of the Cuspidor and Makes It Easier to Clean



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That Unsatisfactory Light in the Laundry need Worry the Laundress No Longer. This Little Lamp is Connected in Series with the Electric Iron, and is Placed Conveniently on the Ironing Board or Near-By Table

This Little Kerosene Hot Plate is Meant to Fill the Needs of Campers and Summer Cottagers. The Well-Designed Burner Produces a Flame That Is Practically Sootless

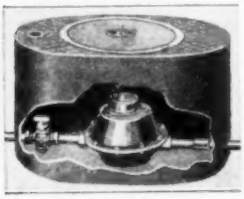
Placing the Dirty Dishes in a Wire Tray, the Housewife Lowers Them into This Dishwasher. The Cover On, Hot Water is Shot from Sprays in Top and Bottom, Subjecting the Contents to a Shower Bath. Waste Water Runs Out of the Spout

TIRE MANUFACTURERS EMPLOY SPECIAL WEIGHING SCALES

Automobile-tire manufacturers test the uniformity of inner tubes and casings by determining their weight. Scales designed especially for this purpose are recent inventions. One intended for use with inner tubes is provided with a convex brass platform, declared to be more convenient than the flat type. A new casing scale is equipped with a rack, instead of a platform, and has the dial mounted on a tall standard, which supports it above the tire when the latter is in the rack.

WATER METER AND CURB COCK HOUSED IN OVAL BOX

Oval water-meter boxes, designed to house not only the measuring device, but the curb cock as well, have been placed on the market by a middle-western manufacturer. A wrench can be attached to the cock without opening the box, by inserting the tool through a conveniently located hole. To reach the meter, however, it is necessary to remove a circular lid, which is equipped with a lock. The key that operates the latter also serves as a handle for lifting the lid. Having slots in the end which fit over the pipe connections, the box can be taken up easily when repairs are needed, and replaced.

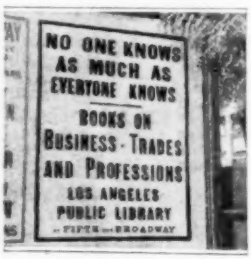


CRUSOE'S ISLE THOUGHT RELIC OF LONG-LOST CONTINENT

From Valparaiso, Chile, a scientific expedition will shortly sail to the Juan Fernández Islands, which, dotting the Pacific Ocean some 400 miles to the west of South America, are the supposed scene of Robinson Crusoe's famous adventures. In charge will be an American zoölogist from Hawaii, who, one year ago, made the important discovery that many fresh-water mollusks from the southern islands are almost identical with those from his mid-Pacific home. This find led him to suggest, at that time, the prehistoric existence of a continent, or bridge of land, between Hawaii and South America; and it is now responsible for this expedition. Studying the flora and fauna of the lonely little group, the professor will attempt to substantiate his theory, and even deduce the date of the lost continent's submergence.

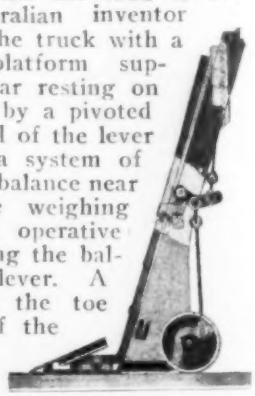
PUBLIC LIBRARY ADVERTISES IN UNUSUAL MANNER

Convinced that advertising benefits any enterprise, the Los Angeles public library has established a precedent for institutions of its kind by employing billboard posters to stimulate interest in books on business, trades, and professions. The demand for such works is declared to have been increased considerably by this unusual method.



HAND TRUCK TELLS WEIGHT OF LOAD IT CARRIES

Now the man with the hand truck will be able to tell when his load is too heavy. An Australian inventor equips the toe of the truck with a small weighing platform supported by a crossbar resting on knife-edges carried by a pivoted lever. The free end of the lever connects, through a system of rods, with a spring balance near the handles. The weighing mechanism is not operative until freed by raising the balance with a cam lever. A pivoted shield on the toe covers the edge of the weighing platform and facilitates loading the truck, whose substantial carrying capacity is not affected by the delicacy of the weighing attachment.



AUDIENCE MADE MERRY BY ODD USE OF INDUCTION COIL

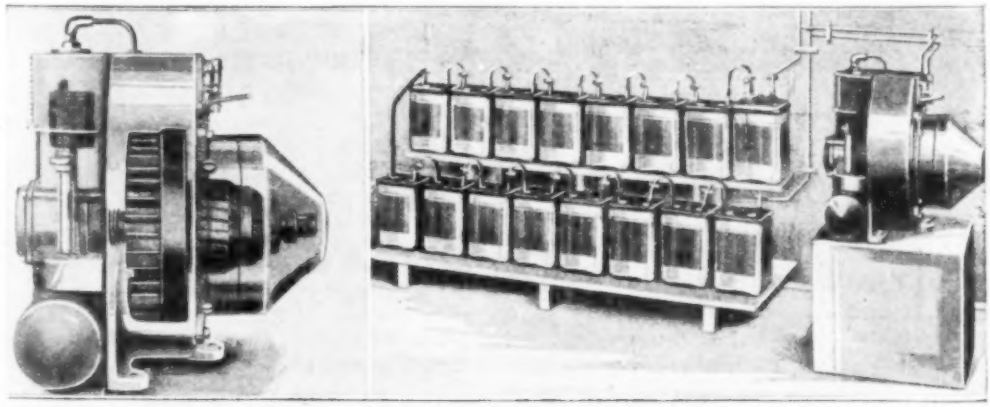
The speaker at a recent meeting of an Ohio commercial club brought his address to a close with direct and eloquent appeal: "How many of you men will pledge $100 a piece to this worthy cause? Please stand." At the last word his right hand shot to the table, and a score of his auditors leaped to their feet. None came forward with subscriptions, however; not a hand moved toward a checkbook. Instead, the twenty turned as one man to an inspection of their seats, while the audience roared with laughter. Finding a steel plate on his seat, and another on the floor beneath his feet, each of them knew himself the victim of a hoax. The speaker's descending hand had closed the switch of a high-frequency induction coil, causing a harmless current to electrify the twenty into a semblance of ardent generosity.

At the Close of His Appeal for Financial Support, the Speaker Smiled in Mock Surprise to See 20 Men Leap to Their Feet. Closing a Hidden Switch, He had Shocked His Auditors with a Tingling Electric Current

ENGINE AND DYNAMO A UNIT IN HOME-LIGHTING SET

An engine, generator, and fuel tank practically combined in one unit, the tank holding just enough fuel to charge the 16-cell storage battery, and indicators on both battery and tank which tell their condition at a glance, are features of a new and simple home-lighting set. The engine uses kerosene, gasoline, or alcohol. All its working parts are inclosed, its cylinder being cooled by air drawn through the generator. It is started with a switch, and stops automatically, by exhaustion of fuel, when the battery becomes charged. One gallon of oil gives a full 120-ampere-hour charge.

¶ Recorded as the seventy-seventh to leave the local ways, the "American Press" was launched recently at Hog Island shipyard, near Philadelphia.



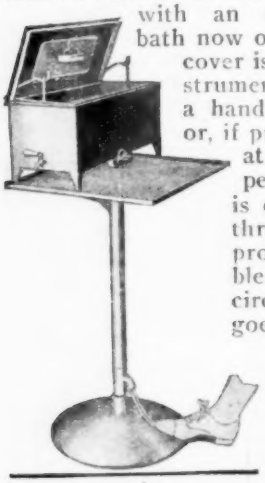
The Engine and Generator Unit at the Left Carries Its Fuel Tank under the Crankshaft. At the Right Is the Whole Home-Lighting Set; the Upper Right-Hand Cell Carries a Permanently Installed Hydrometer

GERMAN GOVERNMENT ISSUES NOVEL POSTAGE STAMPS

Postage stamps issued by the present German government bear little resemblance to those used when the monarchy was in power. Not only are the new stickers entirely different in design from the old type, but they are noticeably larger, and somewhat brighter in color, judging by a 10-pfennig sample that arrived in this country recently. This stamp is 1 3/16 in. long, 15/16 in. wide, and is printed with red ink. The familiar head of Germania is missing from the modern stamp, being replaced by a conventionalized tree. Instead of "Deutsches Reich," meaning "the German Empire," is a legend which means "the German National Assembly," when translated into English.

ELECTRIC STERILIZING BATH FOR DENTAL INSTRUMENTS

Progressive dentists find the sterilization of their instruments a simple matter with an electrically heated bath now on the market. The cover is raised and the instrument basket lifted by a hand lever at the side, or, if preferred, by a pedal at the base of the pedestal stand, which is easily operated. A three-heat switch is provided, and a fusible plug breaks the circuit if the bath goes dry.



¶Prominent Chinese have formed an organization for the purpose of carrying on a campaign against the long-established oriental custom of binding the feet of female children. Members are pledged not to marry a woman whose feet have been deformed by the practice.

PLAN CHANNEL FOR WARSHIPS AT SAN FRANCISCO HARBOR

Naval authorities have recommended the construction of a channel, large enough to accommodate the dreadnaughts of the Pacific fleet, at the entrance to San Francisco Harbor. One plan provides for a passage 45 ft. deep and 1,500 ft. wide across the bar, which now prevents the largest war vessels from coming into the port in safety. Because of the heavy swell in the bay, experts declare that the channel should be at least 7 ft. deeper than the maximum draft of the ships which will use it.

INDICATING MIRROR FOR AUTO MEASURES DISTANCE BEHIND

The "rear-vision" mirror commonly used in a haphazard way by auto drivers has been turned into an instrument of precision by an ingenious New York manufacturer. The improvement consists merely of red lines ruled on the face of the mirror, and lettered to indicate safe or dangerous distances. The driver, by a glance at this convenient attachment, can tell just how close he is to a car or other object behind. It is graduated in feet down to 10, the center line indicating 50 ft. The lateral position also is shown.

GARMENT INDUSTRY TO MOVE BODILY INTO NEW AREA

Sixty cloak and suit manufacturers of New York City, with an annual output valued at $650,000,000, are soon to move their establishments from their many locations along Fifth Avenue to a less exclusive neighborhood not far away. As the tone of the famous shopping thoroughfare is being lowered appreciably by the infiltration of industry, the remarkable migration has the enthusiastic approval of the avenue merchants and property owners. Real estate in the new area is so cheap that the 60 pioneers have bought, in coöperation, 92,000 sq. ft., and now hold options on as much more.

Upon this ground they propose to build, in coöperation again, four factory buildings, of 16 stories each. Rents in these buildings will be so low that a fall in the price of women's apparel will be almost inevitable.

IMPROVED PROCESS DEVELOPED FOR CHANGING ORE TO METAL

A general and secret process for reducing molybdenum sulphide into metallic molybdenum, and tungstic acids into tungsten powder, is the result of wartime experiment by Norwegian investigators. The cost of converting the ore into metal, by this formula, is said to be lower than by any other known method; in addition, the final product, in the form of small tablets, is of superior quality and is completely free from sulphur, carbon, and oxygen.

GLASS FOR GIVING LIQUIDS TO RECUMBENT PERSONS

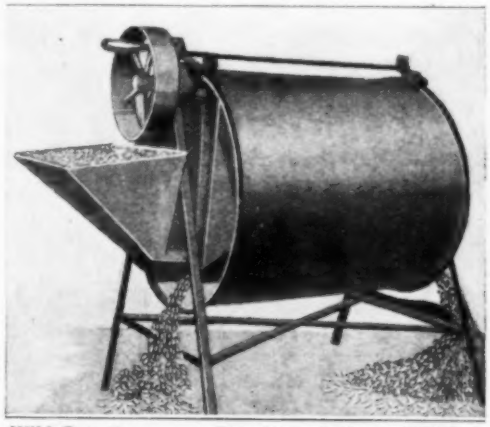
Administering liquid food or medicine to persons lying on their backs in bed is difficult, even for a trained nurse. To

The Drinking Glass Pictured on the Right is Designed to be Used, as Shown on the Left, for Giving Liquids to Hospital Patients

facilitate this operation, a novel hospital drinking glass is now on the market. The lower portion of the vessel is similar in shape to an ordinary tumbler. On top of this is a tapering hood, which is provided with an eccentrically placed, slanting opening. If not more than half-filled, the device can be held in a nearly horizontal position without spilling the contents.

MACHINE CULLS WILD OATS FROM CULTIVATED GRAIN

Separating wild oats from the cultivated variety is the function of a device recently invented by a western farmer, who based the machine on the fact that the uncultivated variety is bearded, while the other is not. The contrivance includes a galvanized sheet-metal cylinder, lined with cotton flannel, and mounted on an angle-iron frame in such



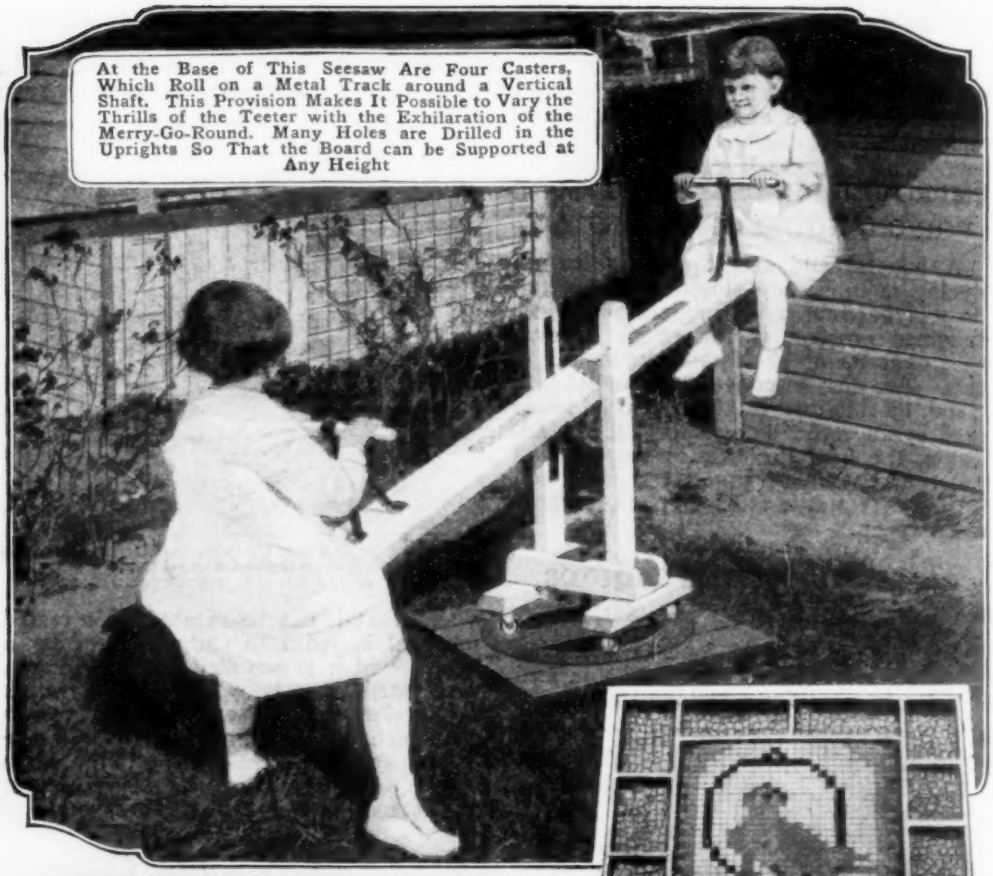
Wild-Oats Separator: Uncultivated Grain, Which is Bearded, Clings to the Cotton-Flannel Lining of the Sheet-Metal Cylinder

a way that it can be rotated. Untreated material is fed into the separator by a worm, which is supplied from a hopper. Cultivated oats travel directly through the device, but the wild grain clings to the cloth, is carried to the top of the drum, and there scraped off by wires into a sloping chute that discharges it at the feed end of the cylinder.

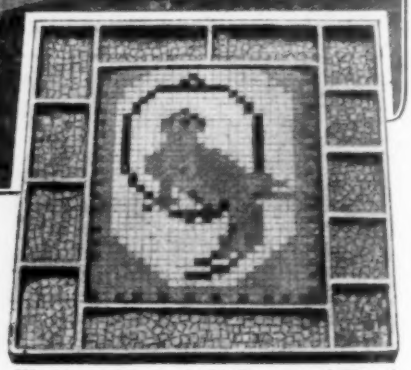
SOCKET FOR VACUUM CLEANER PROTECTS LIGHT FIXTURES

To prevent tension on vacuum-cleaner cables from damaging ceiling light fixtures is the purpose of a recently invented device. A standard plug is set in a heavy cast-iron block, and connected with a long cord. Attached to an overhead fixture, the contrivance receives the plug of the cleaner cable. If the latter is pulled tight, or jerked, the block is moved, but no injury is done to the fixture. The block is provided with a handle.

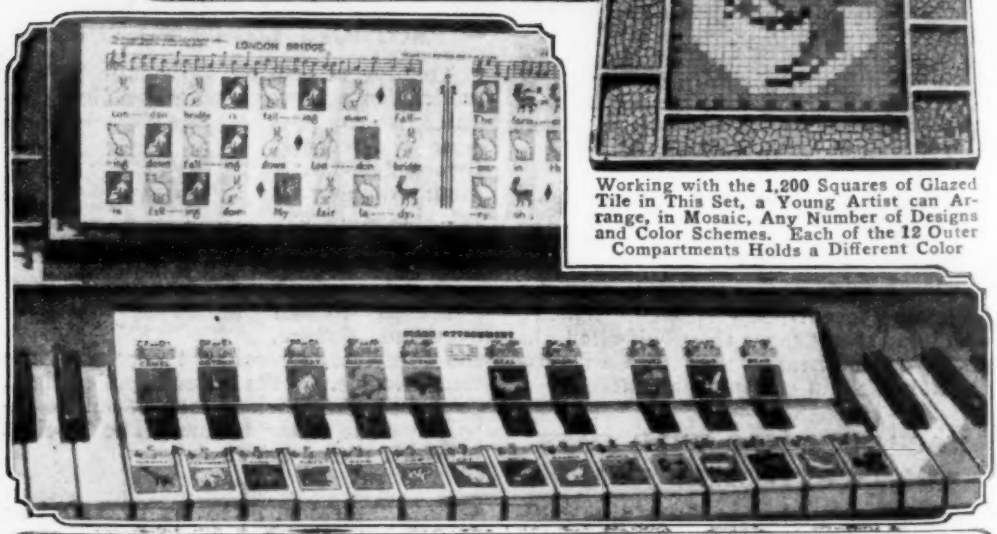
¶Since the recent discovery by American Red Cross physicians that the river Jordan, in Palestine, contains many disease germs, bathing in the famous stream has been forbidden by local authorities.



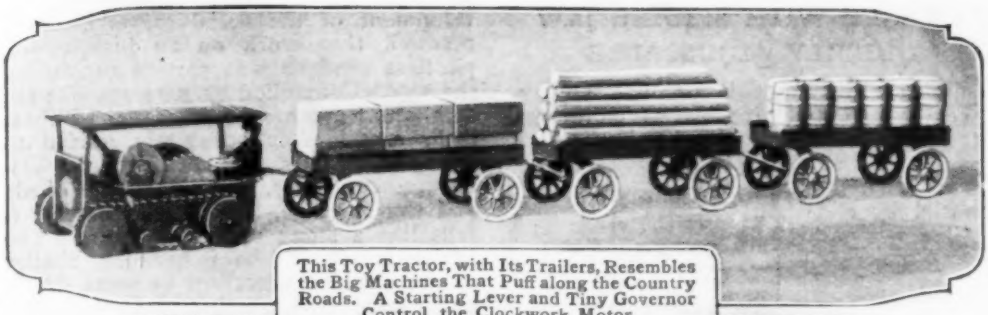
At the Base of This Seesaw Are Four Casters, Which Roll on a Metal Track around a Vertical Shaft. This Provision Makes It Possible to Vary the Thrills of the Teeter with the Exhilaration of the Merry-Go-Round. Many Holes are Drilled in the Uprights So That the Board can be Supported at Any Height



Working with the 1,200 Squares of Glazed Tile in This Set, a Young Artist can Arrange, in Mosaic, Any Number of Designs and Color Schemes. Each of the 12 Outer Compartments Holds a Different Color

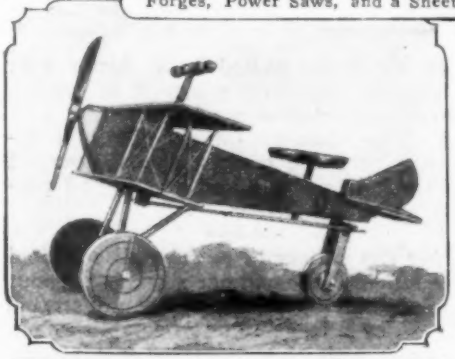


Knowing the Keys by Such Colorless Names as C, C Sharp, D, and So On, the Small Pianist may be Excused for Losing Interest. But When C Becomes the "Giraffe," C Sharp the "Camel," and So On for the Octave, Interest Returns. It will be Observed That the Student Reads "Animals" Instead of Notes, and Identifies the Keys by Means of a Folding Chart Which Rests upon the Keyboard, but Exposes the Individual Keys



This Toy Tractor, with Its Trailers, Resembles the Big Machines That Puff along the Country Roads. A Starting Lever and Tiny Governor Control the Clockwork Motor

These Grammar-School Boys Form Part of a Self-Supporting Industrial Corporation That Manufactures Furniture, and Substantial Toys like Those Above. The Work is Done in the Manual-Training Shop, Equipped with Lathes, Forges, Power Saws, and a Sheet-Metal Plant

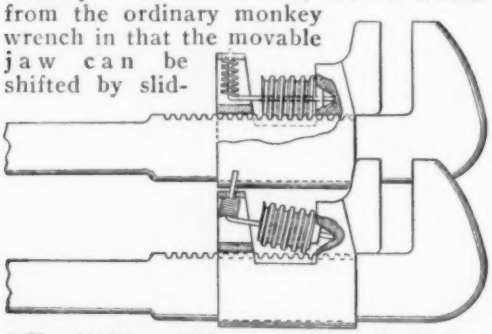


The Sidewalk Becomes a Busy Airdrome When the Five-Year-Old Airman Mounts This Wooden "Airplane." When the Car Is in Motion the Propeller Spins, and the Rudder Turns with Every Twist of the Steering Wheel in the Rear. The Length over All Is 38 Inches; the Wing Span, 31 Inches

No Other Car is Propelled like This One. A Backward Pull on the Handle Causes the Rubber-Tipped Bar to Push against the Ground, and So Drive the Car Forward. It is Steered by the Feet

WRENCH WITH SLIDING JAW QUICKLY ADJUSTABLE

Quick adjustment is possible with a recently invented wrench, which differs from the ordinary monkey wrench in that the movable jaw can be shifted by sliding, instead of by the slower means of turning the worm. The latter is placed on an axle which is held in position at one end by a small coiled spring. By a slight pull on the worm, the gear is disengaged from the teeth on the body of the wrench, and the movable jaw can be slid to the point desired. The wrench is tightened in the usual manner when the worm resumes its original position.



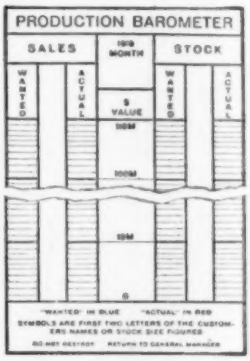
A Movable Worm, Which can be Engaged, as Shown Above, or Disengaged, as Pictured Below, Makes Possible Rapid Adjustment of This Wrench. A Coiled Spring Holds the Worm in Normal Position

FIRST AUTHENTIC NEWS GIVEN OF ARMY'S AERIAL TORPEDO

Although details must still be withheld, a recent statement by the former chief of the equipment division, U. S. Air Service, makes it possible to give limited publicity to America's secret development of the aerial torpedo. It is revealed that work on an inexpensive, pilotless airplane was carried far during the war. Controlled by wireless, like the rumored German weapon, one of these little machines is accurately guided to a city 100 miles away. Here, the disclosure continues, the wings are shed; and the fuselage, loaded with explosive, falls like a stone upon the target. The device is seen to be remarkably similar to the airplane described in some detail, in the June, 1919, number of Popular Mechanics Magazine.

FACTORY "BAROMETER" RECORDS PRODUCTION AND SALES

Wall charts of various forms, known as "thermometers" and "barometers," have come into great favor lately for recording the progress of business undertakings. A form used by an eastern ball-bearing factory provides a record of each month's sales and production. It has four columns: sales, wanted and actual, and stock, wanted and actual. The columns are graduated vertically in thousands of dollars, and filled in with blue for the "wanted" and red for the "actual" columns. Symbols are also used indicating customers' names or stock-size numbers.

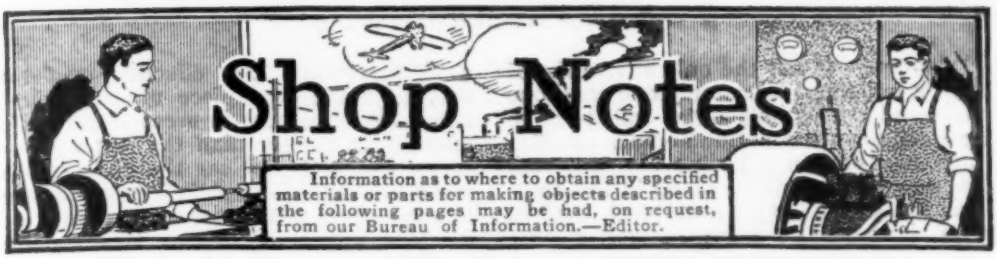


MANY SPEEDS FOR SMALL AUTO WITH NEW GEAR ATTACHMENT

Small autos of the planetary-transmission type are given an unusual range of speeds by a new accessory, which acts as an auxiliary transmission and gear shift. When the attached gear lever is central, the regular gear arrangement is maintained. With the lever pulled back, lower gear ratios are engaged; when it is pushed forward, the ratios are higher than normal. The same conditions obtain in reverse, giving the car six speeds forward and three backward, and meeting all possible road conditions.

Attachment for the Planetary Transmission of Small Autos, Giving Six Speeds Forward and Three Reverse

¶ That the variety of merchandise offered by a modern department store is without limit has just been demonstrated by a large London establishment, which advertised for sale a complete line of five-room houses. The store also promises early delivery on a large number of semi-detached concrete six-room cottages, at a very reasonable price.

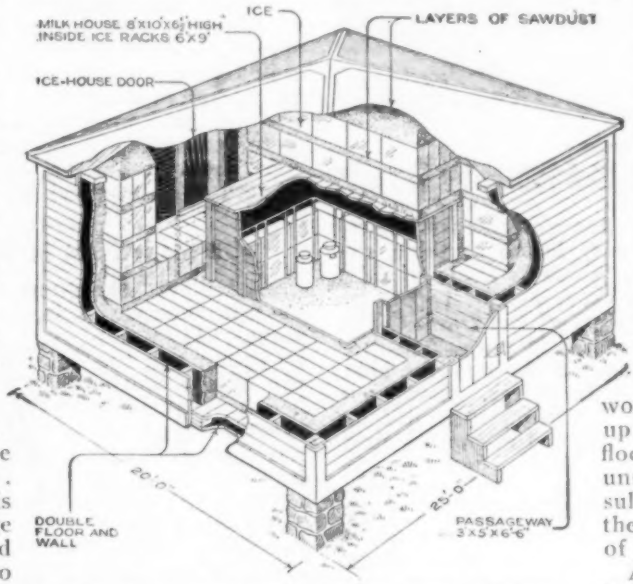

Shop Notes
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

Combined Ice and Milk House for the Farm

By J. HORACE VAN NICE

A COMBINED ice and milk house for the farm should appeal to the practical man who is looking for results with the least expense and labor. The house shown in the drawing should cost much less than two separate buildings, and is certain to save both ice and labor.

The milk house is just a room built inside the usual double-walled ice house, where the air space will serve as an insulator for both. A passage, about 3 ft. wide, leads from the milk house to a doorway in the ice house. Since the walls of this passage are double, and since it has two doors, there is little loss through the necessary entering of the milk house. Ice is removed from the ice house proper by means of a door on the side of the house opposite the entrance to the milk room.



A Milk House Built within the Ice House Presents a Smaller Amount of Heat-Absorbing Surface than Two Separate Buildings, and Is, Besides, Cheaper to Construct

Sawdust is used in the ordinary manner to protect the ice, and to insulate the milk room from the ice chamber. It is also used on the floor of the milk room. If bars are laid across the ice door, as shown, sawdust can be held in front of it, so that ice may be piled clear up to the door.

For the cooling of the milk room, ice racks along the three walls hold a large supply of ice which cools the room thoroughly and at the same time lasts for long periods, since the room is so well insulated. These racks may be made of either wood, iron, or pipe, as desired. The large surface of ice exposed insures a temperature almost impossible to obtain in the ordinary milk house, and yet there is little waste of ice through melting. Since the milk room is entirely inclosed, it should be provided with an electric light if possible. Otherwise a lantern may be used. The electric wiring would best come up through the floor, and should be unusually well insulated, owing to the large amount of moisture.

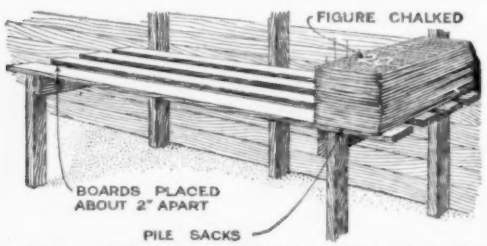
As in any ice house, better results will be obtained if the building is high enough on its foundation to insure circulation of air underneath the floor. The floor and walls are double, providing a complete dead-air space around the ice. Then there should be at least 6 in. of sawdust between the ice and the walls or floor. Also, there should be a thick layer of sawdust between layers of ice.

While the building may be built in any size, the milk room of the size given will in most cases hold all the milk on hand at one time. It will also provide storage space for other foods, vegetables, butter, and eggs.

Handiness is not the only advantage of such a building. Since only one roof, one floor and one double outer wall have to be built, the combination is much cheaper than two buildings having the same capacity. Again, the ice saved in the combination amounts to a great deal, both in time, money, and labor. For a farmer who harvests his own ice crop, such a building is an ideal investment.

Platform for Empty Sacks

A platform on which empty cement or plaster sacks can be sorted and baled is

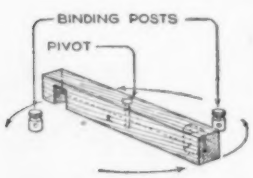


A Special Platform for Collecting and Tying Up Sacks Effects a Considerable Timesaving in This Work

an easily constructed convenience. It resembles an ordinary bench or table, except for its top, which is made of 6-in. boards, nailed a short distance apart on the horizontal pieces of the frame. The latter may be fastened to a wall and supported by two legs on the opposite side, or provided with four legs. Sacks are sorted according to brand, and piled on the platform as indicated in the drawing. A crayon is used to write a figure on the top sack of each pile to indicate the number of sacks in the pile. The spaces between the top boards make it easy to pass baling wire under the piles.—B. R. Glatts, Twin Falls, Idaho.

Protecting Battery Terminals on Bench

Tables for experimental work, or benches in repair shops where electrical testing is often necessary, are frequently equipped with two binding posts connected to a storage battery. Unless care is always taken to see that the switch is opened when the current is not needed, tools lying on the bench may be pushed against the posts, thus causing a short circuit. An effective insulator may be made of a piece of hard wood, about 1½ in. square in cross section, and about 1 in. longer than the distance between the posts. Near the ends of the piece, cut notches slightly larger than the binding posts, the notches to be cut on opposite faces, as shown. The wooden piece is then pivoted in the center, and on a line drawn between the two posts. Thus, when the binding posts are not in use, this insulator may be swung in position to hide the posts in the notches, protecting them from unintentional short circuits.—Kenneth Coggeshall, Webster Groves, Mo.

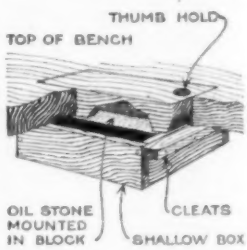


Pressing Knees of Trouser Legs

To remove bagginess from the knees of trousers, each leg of the garment is spread on a flat, padded surface, with the seams on the sides, and the front crease on top and in the center. The baggy portion is then covered with a dampened cloth, to which a hot iron is applied. After this treatment, the trousers are pressed in the usual way.

Oil Stone Kept in Bench Top

First mount the stone in a block of 2 by 4-in. lumber, 4 in. longer than the stone. Then cut an opening in the top of the workbench that will exactly contain the block, when it is dropped in with the stone down, and leave the other side of the block just flush with the top of the bench. If the bench is of 1-in. material, it will only be necessary to nail a cleat across the underside of the bench at each end of the opening, and to cut a shoulder at each end of the block so that it can drop down on the cleats till the upper side is flush with the top of the bench. A shallow box, nailed by means of cleats on the underside of the bench, will keep out dust and provide a place for a bottle of oil. This arrangement will take up no bench surface, and the stone is always at hand. A thumb hold should be bored in one end of the block so that it can be lifted out easily, and this end may be rounded off slightly to facilitate the lifting.

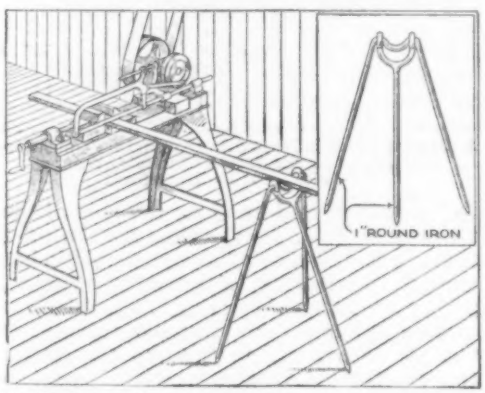


Remedy for Slipping Cone Clutch

A hacksaw and a little ingenuity helped an autoist to get his heavily laden car through woods and over sandy roads, miles away from a garage, when the clutch slipped and failed to provide the necessary pulling power. The blade of the saw was broken into pieces as long as the width of the leather belt, and these were then driven, at equal intervals, between the clutch and the leather. The latter was thus raised, and, when engaged, the clutch held firmly, remaining in good condition for a long time. The plan is an easy one, but care must be used to place the pieces of saw so as not to shear off the copper rivets.—Loyal F. Garris, Jackson, Mich.

Support for Stock being Cut on Power Hacksaw

Cutting long material in a power hacksaw is a difficult task unless some means is used for supporting the stock on a level with the bed of the machine. For this purpose a tripod can be made from iron or steel bars, which are shaped and assembled as shown by the drawing. The construction of the joint at the top of the three legs permits alterations in height by simply adjusting the spread of the legs. This feature makes it possible



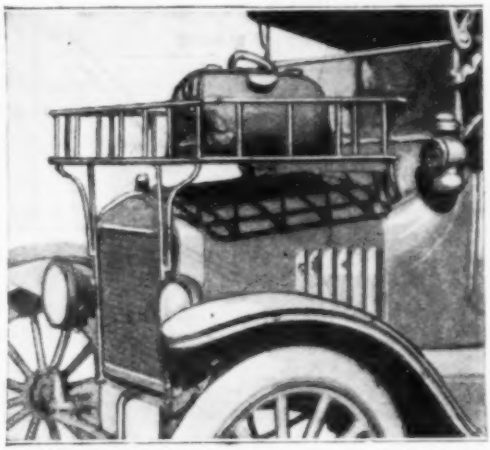
Stock Support for Power Hacksaw: The Height of the Tripod can be Varied by Changing the Spread of the Three Legs

to use the support on an uneven floor, or on the ground.—Frank W. Roth, Joplin, Missouri.

¶A nonheating knob for a pot cover may be made from an old fuse plug. The rivet in the end of the plug is removed, and the cover is attached by a small stove bolt.

Baggage Rack over Car Hood

The baggage rack shown in the accompanying photograph is in daily use for carrying grips and suitcases of guests



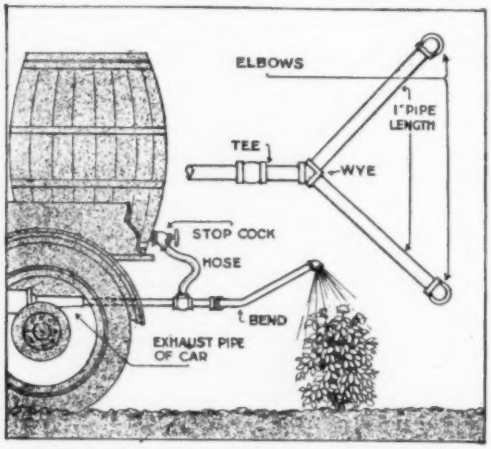
A Metal Rack, Placed over the Hood as a Baggage Carrier, Is Both a Convenience and an Advertisement for the Proprietor of the Hotel

from the railway station to an Ohio hotel. The rack is made of ⅜-in. pipe, mounted on two ½-in. rods fixed to the cross member of the automobile frame. The floor is a lattice of iron strips 3/16 by 1 in. in size, placed about 4 in. apart. The rear end of the rack is supported on brackets which project from the cowl. The rack is 24 by 30 in. in size, and carries several heavy suitcases quite easily. Those on the driver's side are laid flat in the rack in order to give a clear view of the road.

Potatoes Sprayed by Exhaust

The exhaust of an automobile engine operates the potato-plant sprayer shown in the illustration. A length of pipe is brazed to the exhaust pipe of a touring car, or truck, and on the end of this is screwed a tee, with its lateral opening turned upward. A short length of pipe connects the tee with a wye, into which are screwed two pipes, bent slightly upward, and equipped at their opposite ends with elbows. The openings of the latter are turned downward. The spraying-liquid container is placed near the back of the vehicle, and connected with the pipes by means of a rubber hose, which is attached to the lateral opening of the tee. A stop cock at the upper end of the hose controls the flow of liquid. To operate the device, the valve is opened, and the machine driven so that the ends of the

branching pipes pass over two rows of plants. The exhaust converts the liquid into spray, which is applied to the plants by the branching pipes. The contrivance

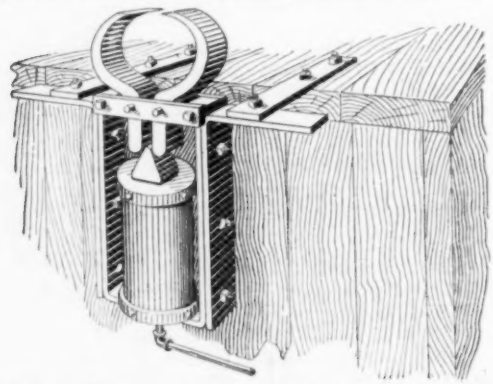


Potato-Plant Sprayer: Two Rows are Treated at One Time by the Device, Which is Operated by the Exhaust of an Automobile Engine

can be utilized for spraying various other vegetables. It is especially adapted for use with a mixture of paris green and water.—Paul L. Fetherston, Ottawa, Ill.

Pneumatic Clamp or Vise

Railroad repair shops are probably the greatest users of compressed air in the mechanical field, and devices such as the little vise, or clamp, in the accompanying sketch are very common. It consists of a cylinder, a piston with a triangular head on end of the piston rod, two clamping jaws, and the necessary frame for at-



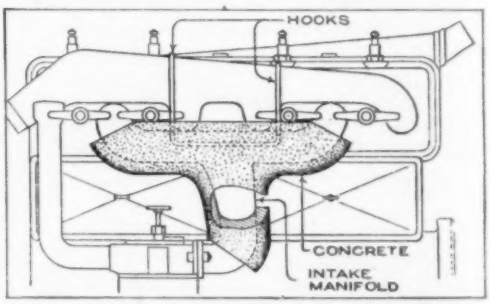
Where Compressed Air Is Available, a Useful Vise may be Operated by a Foot-Controlled Air Valve

taching to a workbench. As made, the cylinder was a piece of ordinary wrought-iron pipe, while the piston, frame, and jaws were forged from scrap. The jaws shown were those used for clamping hose to pipe nipples, but other styles of jaws made the vise suitable for holding work for chipping, filing, or other operations. With garages using compressed air in more and more ways, devices such as this soon pay for their cost in labor and material.

Manifold Heated by Concrete

A motorist who experienced difficulty in starting his automobile engine, after letting it stand in a cold garage overnight, constructed a concrete block, molding it to the exact shape of the intake pipe. Two hooks for supporting it were imbedded.

The scheme involves no danger, as from fire in heating the manifold with an open flame, or troublesome disorders such as are likely to ensue when hot water is poured around the carburetor. The concrete form is heated by simply placing it inside the furnace door a few minutes prior to using the car; then it is taken



A Cement Block is Heated in the Furnace and Afterward Hung on the Intake Manifold, Heating It Quickly for an Easy Start

to the garage and hung on the side of the intake manifold. By the time the motorist is ready to "crank up," the manifold is hot enough to vaporize the incoming gasoline, giving an immediate start. The block is carried under the hood at other times; if trouble occurs during the day, the owner can use the block again by reheating it in some convenient furnace or fire.—G. A. Luers, Washington, D. C.

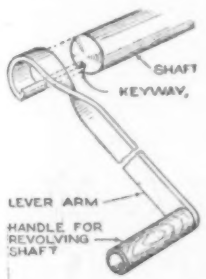
Fine Points of Valve Grinding

The better the finish on valves and valve seats, the longer they will wear. When grinding valves, use only fine grinding paste, unless the valves are in very bad condition. This avoids a good deal of scratching and scoring, which is likely to occur with coarse com-

pound, unless the grinder is an expert. When the job is nearly finished, wipe all the abrasive off the valve only; put a little more oil on the seat with the remainder of the compound that sticks to it, and continue grinding. Wipe the seat off perfectly clean, leaving the paste on the valve. Repeat this a few times until the abrasive is "dead." Then put a little graphite and oil on, together with the remainder of the compound, and give a finishing rub. By this time the valve and seat will be very smooth and polished, and the surface will be in fine working condition.—Howard Greene, New York, New York.

Handle for Rotating Shafts

The shop mechanic often finds it necessary to rotate the shaft of a motor, engine, or other machinery upon which he is making repairs. This operation may be accomplished with ease with the aid of a detachable lever or crank. For shafts under 1 in. in diameter, it is suggested that the lever arm be made of mild steel 3/16 by 1 by 12 in. At one end a suitable handle is made, its axis being perpendicular to the 1 in. surface. At the other end, the steel strip is given a half twist, and the 1-in. width is formed around the shaft, as shown, the extreme tip of the strip being bent in to catch in the keyway of the shaft. To turn the shaft it is only necessary to slip the curved hook of the handle over the end of the shaft so the tip will engage with the keyway, and turn as if cranking an automobile. This is an excellent tool for inspectors; they can thus easily rotate the movable parts so as to make a thorough examination.



Gummed Paper in Machine Shop

There are many cases when small machine parts must be held together temporarily, for example while screws are being put in, or while adjustments are being made. In one shop, several widths of gummed paper, in rolls, are kept for just this purpose. The sticky tape is quickly and conveniently bound around any part and holds against moderately severe strains.

Electric Lighter on the Bench for Gasoline Torches

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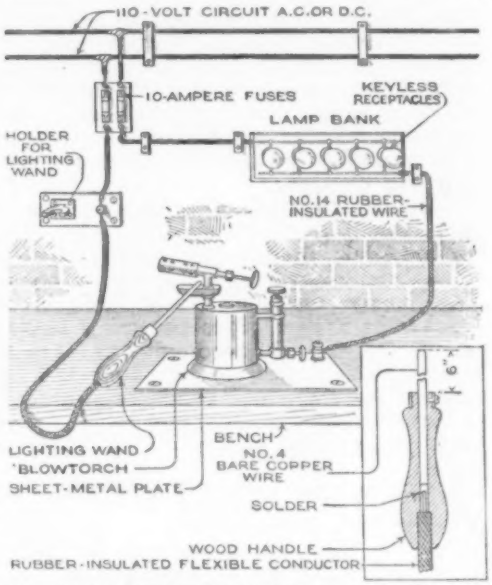
An electric lighter for gasoline torches, suitable for the shop, is shown in the drawing. Electricity is obtained from an ordinary lighting circuit, and either direct or alternating current can be used. A bank of multiple-connected incandescent lamps limits the current by resistance. One wire from the bank is attached to a metal plate, fastened on a bench, while the other terminates in the lighting wand, detailed in the illustration. When a torch is set on the plate, and the wand applied to the filled gasoline cup, the fluid is ignited by the resulting spark. If the number of lamps is increased, a better spark will be obtained. Fuses are installed as indicated. The holder for the wand is not essential, but is convenient. When the device is fed by a circuit which has one of its side conductors grounded, the lead to the bank and plate should be connected to the grounded wire. In the case of a grounded neutral conductor in a three-wire system, the same lead should be connected to the neutral wire.—Alfred H. Hayes, St. Louis, Missouri.



Electric Lighter for Gasoline Torches, Installed on a Bench: The Device Obtains Current from an Ordinary Lighting Circuit

¶An efficient foot scraper is made from a discarded currycomb attached at some convenient point on porch or steps.

HOW TO MAKE A FIRELESS COOKER

By KENNETH COGGESHALL

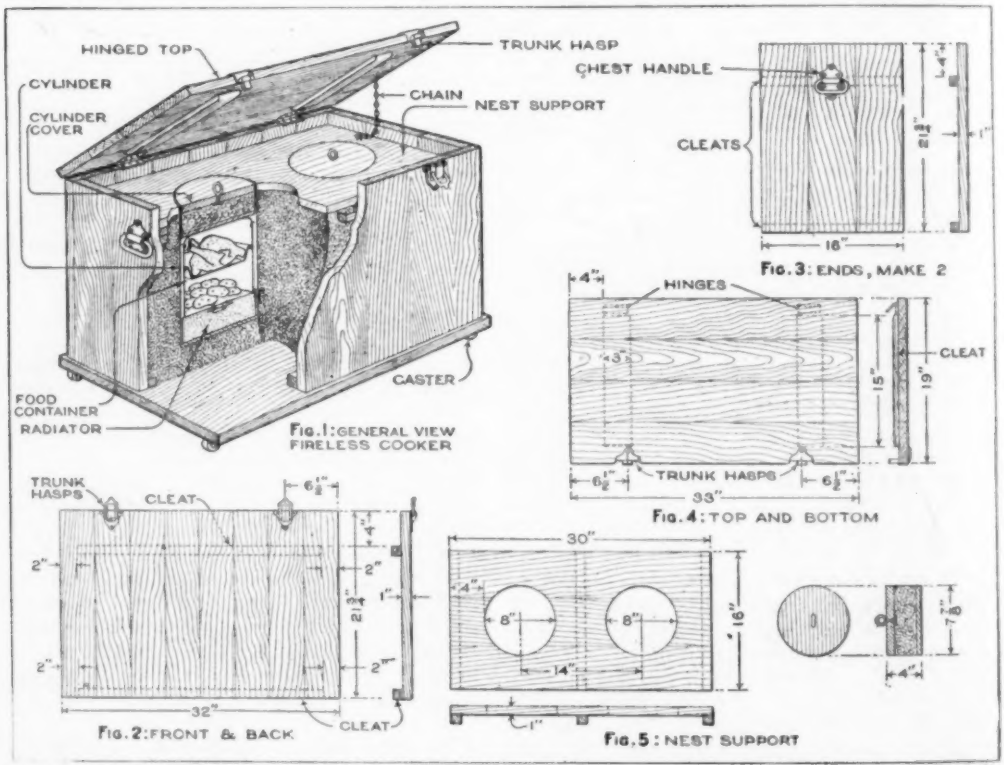
A FIRELESS cooker is a device so constructed that, through the agency of insulating materials, accumulated heat may be retained. Just as the walls of a refrigerator insulate ice from any heat outside the box, so a fireless cooker prevents heat radiation from its interior compartments to the relatively cooler surrounding air. Food, therefore, may be brought to cooking temperature, removed from the source of heat supply, and placed in a fireless cooker, where the process of cooking will continue.

The construction of such a cooker is not complicated; no special tools, skill, or materials are required. And, because of its many advantages over stove cooking, every kitchen should contain a cooker as a part of its necessary equipment. Its use will accomplish a material saving in fuel, decrease the time and labor of cooking, and eliminate heat and odors from the kitchen, and besides provide thoroughly cooked, fully flavored foods.

The requisite parts for such a device are a box; a bucket or kettle for holding the food; a container, or other metal nest lining, for the bucket, and a quantity of good nonconducting or heat-insulating material.

While the outside container may be made from any tightly constructed box, half barrel, or small trunk, a chest built for the purpose will not only present a more pleasing appearance, but will be more economical of space. One-inch cypress boards, free from all knots and other defects, should be used. Cypress, if properly finished, will give beautiful grain effects, and is less expensive than hard woods. Lighter lumber should not be considered unless well braced; the pressure exerted in tamping in the insulating material is likely to bend out of shape the boards of the box, if they are thinner than the weight specified.

The general appearance of the chest is shown in Fig. 1. The front and back are matched and fastened to cleats or crosspieces, as indicated in Fig. 2. Two end sections, seen in Fig. 3, are constructed



In Figs. 1 to 5 are Shown an Assembly View of the Fireless Cooker, and Details of the Various Parts of the Chest. This is Made Quite Solid, and Mounted on Casters for Easy Moving

similarly. Cross cleats are also utilized here, at both top and bottom, to hold the boards in position.

While the top and bottom sections, shown in Fig. 4, are identical as to dimensions, they may be different as to finish. It is permissible to use rough, unfinished lumber for the bottom; the top should be constructed of selected cypress to match the sides and front of the chest. Moreover, since both sides of the top are presented to view, the workmanship should be of the best.

The sides, front, and back should be first assembled, leaving the cover and bottom until later. Two inches from the top edge of the chest, a wooden nest support should be fastened in position. This support is constructed as shown in Fig. 5. Using a keyhole or band saw, cut two 8-in. holes, at the positions indicated.

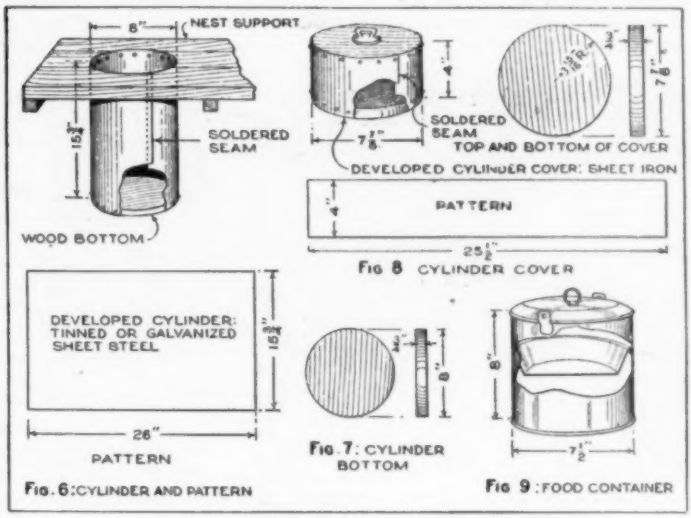


Fig. 6: CYLINDER AND PATTERN

Fig. 7: CYLINDER BOTTOM

Fig. 8 CYLINDER COVER

Fig. 9: FOOD CONTAINER

Figs. 6 to 9 Illustrate Parts of the Two Cylinders Which Hold the Food Containers; Also a Suggestion as to the Container Itself

The metal cylinder lining, illustrated in Fig. 6, is cut from sheet zinc or galvanized iron; it is rolled into a cylinder, and the seam soldered. For a cylinder of this size, the developed dimensions of the flat metal will be as given in the pattern. It may be found possible to use heavy cardboard instead of sheet iron, but the latter is more durable and far more sanitary. Two such cylinders are required.

Prepare two wooden disks, detailed in Fig. 7, to serve as bottoms for the cylinders. Fasten them in place, as shown in Fig. 6, with small nails. The free ends of the cylinders are then fitted in the 8-in. holes in the wooden support, and fastened with screws or nails. The nests being thus prepared, the insulation may be packed in place.

Practically any material which will not conduct heat may be used as a packing. Mineral wool is perhaps the best, since it is fireproof, sanitary, and odorless. It is recommended for the cooker here described. Asbestos is also fireproof, and may be used with success. Ground cork, such as is used in packing grapes, is excellent, and can probably be obtained from a fruit dealer. Other suitable insulators are Spanish moss, excelsior, wool, cotton, crumpled paper, hay, and even hard-coal cinders. If fireproof insulation cannot be obtained, a sheet of asbestos should be wrapped around the outside of each metal cylinder.

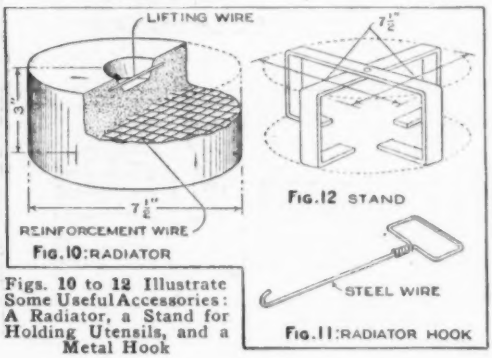
With the chest upside down and the bottom removed, carefully pack in the insulating material. Every crevice, especially, near the metal cylinders, must be tightly tamped full of the packing. Fill up, as far as possible, all air spaces which might cause heat convection. When the insulation fills the chest to the level of the edges, screw or nail the bottom section in place.

The top should now be attached, the hinges being placed at the back. A light chain may be used to prevent the top from falling backward. Two chest fasteners, secured at the points indicated in Fig. 2, may be utilized to hold the top tightly closed when the cooker is in use. A handle on each end of the chest will improve its appearance as well as aid in moving the cooker about. Easy-running casters should be provided, one at each of the bottom corners. Stain, oil, or varnish may be used to complete the finished surface of the chest.

The construction of the insulating cover, seen in Fig. 8, requires some degree of skill in matching the 8-in. holes in the nest support. Two metal cylinders are formed, of dimensions given. Two wooden disks, as detailed, are required for each cushion. Fasten one of these disks in place as a bottom to the cylinder, fill the container thus formed with the insu-

lating substance, and attach the top wooden disk. After an addition of a wire handle, or a knob, in the upper disk, the assembled cushion appears as in the first view, Fig. 8.

Needless to say, the kettles or containers for cooking should be durable, and as free as possible from seams. Perpendicular sides are necessary to insure a tight fit in the nest. Obviously the container covers should also fit closely, to prevent the escape of steam. While it is possible to purchase utensils for use in fireless cookers, a bucket serves the purpose just as well. The cooker here described is designed to use two standard 6-qt. buckets. Larger containers may, of course, be substituted, provided at least 4 in. of insulating packing surrounds them. While tinned ware can be used, experience shows it will rust after but short use. Enamelware, or better still, aluminum, insures longer service; a suitable container is illustrated in Fig. 9. If the handle is in the way, remove it, and provide two metal hooks for lifting the bucket out of the nest, similar to the one mentioned below for lifting the radiator.



Figs. 10 to 12 Illustrate Some Useful Accessories: A Radiator, a Stand for Holding Utensils, and a Metal Hook

It is not always necessary, as experience will prove, to furnish additional heat to assist the process of cooking. A much wider range of cooking, however, is provided if an extra source of heat supply is available. Soapstone radiators may be purchased for fireless-cooker use, but a brick, or iron disk, such as a stove lid, proves just as efficient. A radiator to match the dimensions of each cooker is easily made of cement. Molds, similar to the cover cushions, should be provided. It is not necessary that the radiator be larger than 7½ in. in diameter, and 3 in. in height. For reinforcement, a disk cut from heavy wire mesh, such as in Fig. 10, is employed. After the cement is poured in the mold, it must be placed in some location where it will dry slowly to avoid cracking. Besides the reinforcement, it is best to provide a lifting wire by forming a depression, exposing the middle part of a heavy wire imbedded in the cement. The radiator can then be lifted by gripping this wire with the hook shown in Fig. 11. The initial warming of the radiators should not be accomplished in haste. This caution also applies to the use of purchased soapstones. Unless these stone radiators are stored in a warm, dry place, they will crack when heated on the stove. Two iron stove lids of the correct size, bolted together, make a much more durable radiator and one that may be heated to a high degree.

Other accessories may be provided as required. A stand, for instance, such as is shown in Fig. 12, is convenient when two pies or cakes are being baked in one compartment. This stand is made of light strap iron, formed as indicated. Pans can be placed both inside and on top of it. Figs. 1 and 9 also present a method of placing a pan inside one of the buckets. Food may thus be cooked in the bottom space while its retained heat assists in the cooking of the contents in the pan above. Three angle lugs are riveted to the side of the bucket to form the pan support.

By referring to the sectional view of Fig. 1, the method of placing the various parts in the nest may be seen. A small dead-air space is permissible between the vessel and the cylinder walls, as circulation of air inside the cylinder cannot carry heat to the outside.

A fireless cooker can be utilized to greatest advantage in preparing foods which require long boiling, stewing, or steaming. Such foods are soups, cereals, meats, steamed bread or pudding, and vegetables. Obviously, large quantities of food, because the accumulated heat is greater, will cook faster and more thoroughly. If it is necessary to prepare a comparatively small quantity of food, good results are obtained by putting it in some container similar to a baking-powder can or a 1-qt. bucket, which should then be placed in the 6-qt. bucket, after pouring into the latter a suitable quantity of boiling water. The radiators, previously heated to a high degree on the stove, will assist in preserving a cooking temperature in the nest compartment.

¶ Empty thread spools, attached to the wall by long screws or nails, make satisfactory clothes hangers.

Plate on Stove Distributes Heat

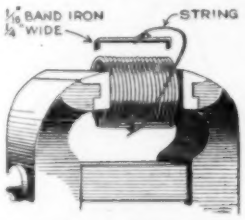
Everyone is familiar with the so-called cannon stove used to heat small depots, railroad repair shanties, and the like. The top of one of these stoves was recently fitted with a loose plate, made from an old piece of boiler steel.

To fit the plate to the stove top required only the cutting of a hole in the plate, for the stove-pipe connection on top of the stove; after this had been done, the pipe was lifted and the plate slipped up over it.

Primarily, the plate was to be used for holding cooking utensils, but it was found that the heat radiating upward along the sides of the stove was deflected downward and outward by the plate, so that a much larger area in the room was warmed than formerly.

Novel Method of Placing Valve Springs

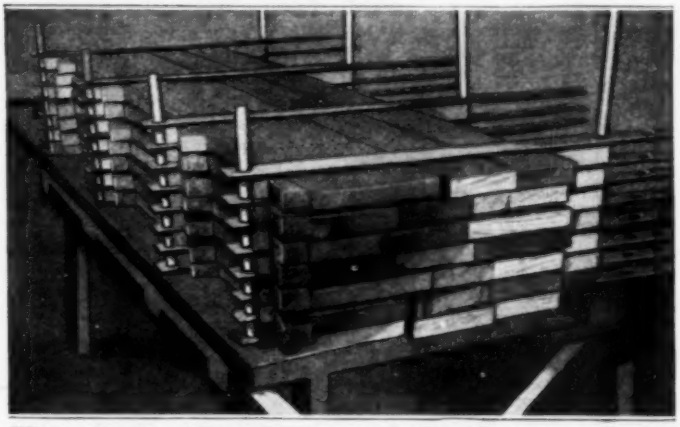
Secure two strips of 1/16-in. band iron of a length equal to the height of the spring when fully compressed, plus an allowance for a 1/4-in. bend-over at each end. While the valve spring is fully compressed in the bench vise, set one of these pieces on each side of the spring to hold it in compression. To both of them tie the ends of a piece of string, about 3 in. long. Now remove the spring, thus held, from the vise, and place on valve stem. After inserting the spring seat and key, take hold of the string loop and jerk the iron pieces from the spring, which will snap into proper position. For time and labor saving, this method is very efficient.—C. Nye, New York, N. Y.



¶To remove stains from the hands, rub them well with a mixture of cornmeal and vinegar before washing in the usual way with soap and water. Laundry soap placed under the finger nails will prevent discoloration.

Gluing Press Made of Strap Iron and Pipe

The photo shows a simple and effective clamp which was made for gluing the sides and tops of cedar chests. Its advantage over the usual type of clamp is that it holds the strips in line securely, so that the glued surface is perfectly flat and true, while, with the common type of clamp, it is often necessary to plane off nearly half of the two surfaces in order to bring out warps and twists.



Where a Number of Large Panels are to be Glued Together, a Clamping Arrangement of This Type will be Found Handy

This clamp consists of a solid table, having a top made of 2-in. material with a series of holes bored for each iron rod; eight round iron rods, and four pieces of strap iron drilled for the rods. Four straps are required for each set to be glued; they are piled up as high as desired.

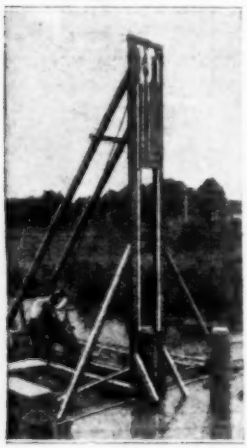
On the back side, blocks of wood are inserted between each rod and the built-up top; on the front side, wedge-shaped pieces of hard wood are driven in. The clamp shown will glue eight tops or sides at a time; it cost about $3 for material.—Dale R. Van Horn, Lincoln, Neb.

Irregular Ripsaw Filing

The results of filing a crosscut saw can be observed quite well by looking down the channel between the points of the teeth, but with a ripsaw this cannot be done. A good way of inspecting the teeth of the latter kind is to bend and straighten it alternately at various points in its length; in this way the teeth can be observed with considerable accuracy. The reflection of light from the various teeth will also aid in telling whether they have been given the correct shape and set.

Improvised Hand Pile Driver

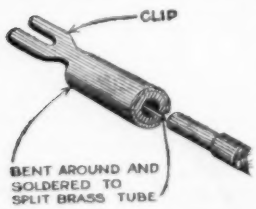
The fact that there was no regular pile driver at hand did not retard the progress of certain bridge builders very long when they came to a pond. They simply took 10 of the timbers which were to go into the bridge, and covered them crosswise with 3-in. plank for a pontoon. They nailed 2 by 2-in. strips on two 4 by 4-in. pieces, 16 ft. long, and raised them as guides for the hammer, which was made from a log of maple, 14 in. square and 5 ft. long. Then, with a rope and block, as shown in the photograph, three men were able to drive eight piles in a day in solid blue clay.



No trip was necessary; when the hammer was hoisted to the top the men let go the rope. A shorter hammer much larger in diameter was used at first, but would not stand the jar; that of smaller diameter and greater length proved much more effective.—W. S. Richards, Albany, Oregon.

Adapter for Telephone Cords

In using a pair of telephones of the kind employed in receiving radio messages and for testing purposes, it is often desirable to have some means of connecting them to ordinary battery binding posts, which are not provided with holes for the insertion of the plugs on the end of the receiver cord. The easily made device shown in the sketch can be utilized for this purpose. A common terminal lug and a piece of brass tubing are the parts needed. The ferrule of the lug is bent around the tubing, which has first been split with a fine saw. The diameter of the tubing is such that the cord plug will fit in it tightly. Solder is used to fasten the tubing to the lug. When it is desired to connect the instruments to an ordinary battery, the plug is pushed into the tubing, and the lug attached to the binding post in the usual manner. The lug can be removed from the plug when a hole for the latter is available.—Frank Sahlmann, Manhattan, Kan.

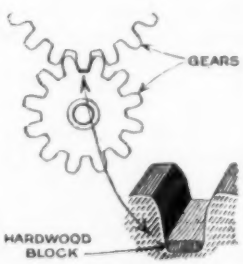


Engine Exhaust Heats Tank

A farmer, who keeps his gasoline engine running almost continuously for operating a cream separator, grinding feed, pumping water, and other tasks, has devised a simple way to heat the contents of a stock-watering tank with the exhaust. The exhaust pot, or muffler, is placed in the tank on a brick foundation, which allows water to circulate around it. The exhaust gases pass through the pot, and are released by an outlet that extends above the surface of the water. The contrivance keeps the water at a moderate temperature.—Chester C. Cook, McMinnville, Tenn.

Gauge for Gear Setting

A firm which sends out machinery to be erected, experienced much annoyance from the fact that gears were often set up with improper clearance, thus increasing wear and tear. The difficulty was overcome by an idea obtained from a draftsman; his suggestion was to send out with each gear a small hardwood block whose thickness represented exactly the clearance to be allowed between the tip of the tooth on one gear and the root of the other gear. By the use of this block a workman without great skill in millwrighting was enabled to space the gears so as to have the clearance exactly right.



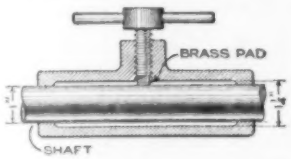
Benzine for Wringer Rolls

The rubber rolls in clothes wringers become badly stained each time they are used. Even careful cleaning with soap and water will not prevent this. When they become almost black they leave streaks on delicate clothes. A little benzine, or gasoline, on a rag will cut the

stain off at once, leaving the rolls white and clean. By turning the rolls, they are quickly cleaned. The benzine should be allowed to evaporate before the wringer is used.—J. Horace Van Nice, Chicago, Illinois.

Tool for Straightening Steel Bars

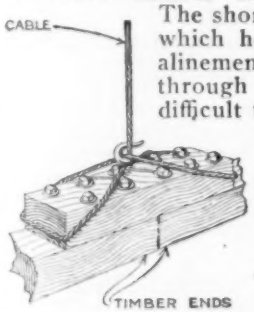
In a shop which uses much bright, drawn-steel bar, from which are turned small shafts, the usual method of straightening with a bar, after mounting the shaft between centers, is not found very successful. Moreover, it is bad for the lathe and lathe centers.



To overcome this was the purpose of devising the bar straightener shown in the drawing. It is cheap, and can be quickly made, complete, by the lathe hand. This one is for a 1-in. bar, and was turned and bored from a 2¾-in. bar; the large diameter was used to provide ample thread distance for the straightening screw.

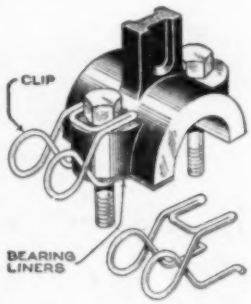
Crane Helps in Unbolting Timbers

Some scaffold uprights, that were discarded by the big shipbuilding company for which I worked, were being unbolted to obtain lumber for other purposes. The short lengths of timber which held the uprights in alinement had 10 or 12 bolts through them, and were difficult to remove. A crane being handy, I passed a cable around them, as shown in the sketch, and when the nuts had been removed from the bolts, signaled for "slow hoist" until the cable was pulled taut. Then I signaled "hoist," and the pieces came off with little trouble. By the same method I have removed angle clips bolted to ways decking. A chain was used to get the angle clips off, as a cable cannot be made into a small enough loop. To get a chain taut on an angle clip requires a very slow hoist. The workman should stand to one side while the hoisting is in progress. —R. W. Goodwin, Philadelphia, Pa.



Clips Hold Bearing Liners

Automobile mechanics who experience trouble in keeping bearing liners in place when refitting connecting-rod bearings will find the clip illustrated a convenience. Brass spring wire is used to make the device. The material is bent into shape with a pair of pliers. A set of clips can be attached to the bearings in a few seconds, and will hold the liners securely in place.—Charles H. Willey, Concord, New Hampshire.



Dishpan Makes Concrete Manhole Form

An easy way to form the manhole for a concrete cistern top, or septic tank, is to use an old dishpan of the desired size. This is set in the regular form, and the outside gives the shape to the opening. The cover is then made by pouring concrete inside the pan up to the level of that outside, thus giving the proper bevel and insuring a fit.

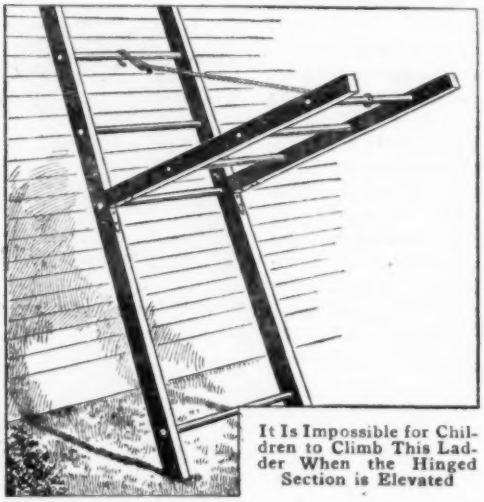
Twisted wire, or a round piece of woven-wire fencing, can be used for reinforcing the cover or lid. A rod, or ring, should be put in and tied to the reinforcing for a handle.—M. W. Lowry, Athens, Ga.

Saving Alcohol from Auto Radiator

Alcohol placed in an automobile radiator to prevent the cooling system from freezing is lost rapidly by evaporation when the engine runs, as many motorists have learned from experience. To save the alcohol, a 1-gal. tin can is placed under the hood, and a hose, connected with the overflow pipe, is inserted in it. Alcohol vapor escaping from the overflow pipe will be condensed in the can.—Harlan J. Lindsley, Constantine, Mich.

Ladder Inaccessible to Children

The sketch shows a ladder that cannot be climbed by children when the hinged section is fastened as indicated. It is an

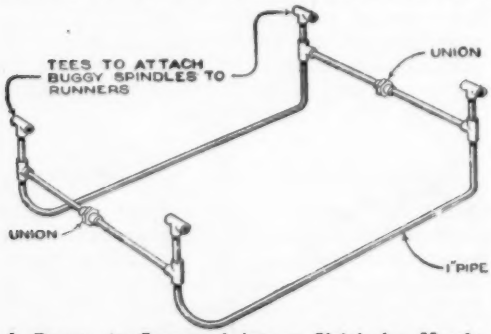


It Is Impossible for Children to Climb This Ladder When the Hinged Section is Elevated

easy matter for an adult to lower the rungs and sidepieces into position. The hinged section is 6 ft. long.—Elmer O. Tetzlaff, Chicago, Ill.

Buggy Converted into Sleigh

The illustration shows how eight pipe tees, two unions, four long nipples, and a few pieces of 1-in. pipe may be connected so as to form a sleigh gear to attach to a buggy. The two long pieces of pipe are bent to form the runners, and the tees are screwed on at the ends. Then come the nipples and other tees. The spindles of a buggy should just slip

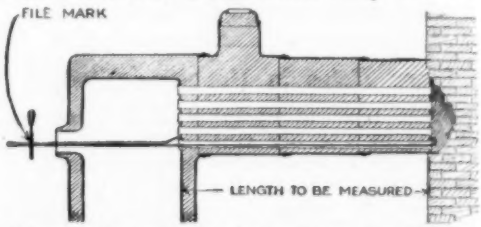


A Buggy is Converted into a Sleigh by Merely Removing the Wheels, and Mounting on the Axle Ends a Runner Frame Made of Pipe and Fittings

inside the upper tees. The runners are held by replacing the nuts on the axles. They are stiffened below by short pieces of pipe and a union, connecting the other tees. The connecting pipe should be of such length that it will keep the runners parallel with each other. To attach the gear, remove the wheels from the buggy, unscrew the short piece of pipe that connects the runners at each end, slip the T-joints over the spindles, replacing their nuts, and screw in the connecting pipe. The union is necessary in order that the pipe may be unscrewed at one end without screwing it in at the other.—H. F. Grinstead, Columbia, Mo.

Boiler Tubes Measured While Hot

Boiler tubes can be measured while the boiler is hot by employing two iron rods, as shown in the illustration. The hooked end of the long rod is pushed entirely through one of the tubes, then pulled back until the end of the hook rests on the boiler head. The short rod is inserted in the fire box, and held against the tube sheet at the other end, beside the tube in which the long rod has been placed. While the rods are in this position, registering file marks are made on both of them, after which they are re-



Measuring Boiler Tubes with Iron Rods: This Method does Not Interfere with the Continuous Operation of the Boiler

moved and laid on the floor, with the marks together. The exact length of the tube is ascertained by measuring the distance from the end of the short rod to the end of the hook. A steel tape should be used for this purpose.

To Find Small Cracks in Tools

Small cracks in tools, frequently difficult to locate, can be found easily by using petroleum and chalk. The former is rubbed over the surface where the crack is suspected to be, and then removed with a rag. The chalk is then applied to the same surface. If a crack exists, the petroleum which has been forced into it will come out at this time, and the line of the fracture can be seen in the chalk.—S. Leonard Bastin, Bournemouth, England.

Electric Toaster for Starting Auto

An old electric toaster is used by a middle-western motorist to assist in starting the engine of his automobile in cold weather. The toaster is placed under the hood, connected to a socket, and allowed to remain in operation for about 30 minutes. Enough heat is then given off to make it easy to start the machine.—Ralph C. Busbey, Columbus, Ohio.

Chicken Coop Made from Trunk

A good two-compartment coop for sitting hens, or hens with chicks, can be quickly made out of an old trunk, the straps on the ends enabling the owner to transport it conveniently. The hinged cover permits examination of the occupants from above, and the walls are not likely to admit drafts.

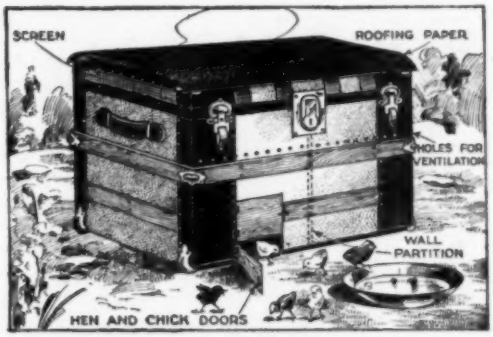
The trunk is divided across the middle by a partition which reaches nearly to the top, and which, for general purposes, should be made of boards, as there will then be no trouble between sitting hens. For fowls brooding chicks, however, a poultry-wire partition, chicken-size, is adequate.

The coop entrances are rectangular holes, 6 in. wide and 8 in. high. For one of the two compartments the entrance is made in the trunk front at the bottom, midway between the partition and the end; and for the other one it is in a corresponding position at the back. The purpose of making entrances on opposite sides is partly to prevent trouble between broods, and partly to enable each brood to get in and out without crowding.

Each of these entrances is furnished with two light wooden doors, hinged at the side, one above the other. The upper door is 5½ in. high, and the lower one 2½ in., the latter being used when it is desired to confine the hen, but release the chicks.

For ventilation, an opening is cut in each end of the trunk lid, about 8 in. long and 2 in. wide, and wire mosquito netting is stretched across it. There should also be a row of air holes about ½ in. in diameter, along the trunk wall, eight or ten being allowed to each compartment.

If the trunk has a rounded top, all that is needed to make the roof rainproof is some oilcloth, roofing paper, or other waterproof material. This is tacked on tightly, and the edges are allowed to extend an inch or so beyond the front and back, so as to protect the walls. If the top is flat, the necessary pitch can be given to the roof by cutting a 2-in. piece of wood the same length as the trunk, and nailing it along the top in the middle.

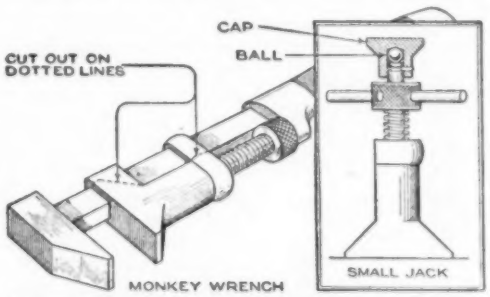


A Few Changes Turn an Old Trunk into a Two-Compartment Chicken Coop Which Lasts for Years

It is good policy to make these changes in such a way that the job will be permanent, as the coop, if stored away carefully after each brooding season, will last indefinitely.—J. T. Bartlett, Boulder, Colo.

Jack Made from an Old Monkey Wrench

With a little labor, an old monkey wrench can be converted into a small jack, which can be used in places where it is impossible to employ an ordinary jack, because of its size. The movable jaw of the wrench is cut with a hacksaw, as indicated, to form the base of the device. Two holes are made in the knurled head, and in these are inserted small rods, which serve as levers to turn the screw. The cap is shaped on a lathe, after which a hole is bored in it to receive the end

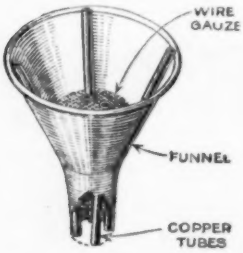


A Handy Small Jack, Which can be Used When an Ordinary Jack Is Too Large, is Made from an Old Monkey Wrench

of the screw. A small pin, inserted in the side of the cap, fits in a groove around the screw, and holds the two parts together. A steel ball serves as a bearing.—S. E. Gibbs, Ames, Ia.

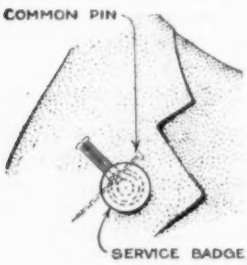
Funnel with Breather Tubes

The inefficiency of a common funnel is due to the fact that while the liquid is being poured into the receptacle to be filled, the air is compressed within and a resultant back pressure occurs.



The funnel illustrated has vent pipes leading from the bottom to the top of the funnel. These pipes carry off the air in the receptacle as the liquid is being poured in, and hence permits rapid pouring. Larger funnels may be equipped with larger vent pipes.

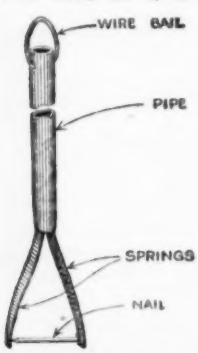
Service Button Fastened on Coat



To prevent the loss of a military-service badge, use an ordinary pin on the back of the coat lapel. Insert the pin at right angles to the buttonhole, close to the shank of the badge.

Recovering Tools from a Deep Well

Small tools accidentally dropped into a deep drilled well can be recovered easily with the simple device shown in the illustration. An old buggy spring is cut in half, and the two sections are inserted in one end of a 3-ft. length of iron pipe, with their concave curved sides facing each other. The end of the pipe is flattened slightly to permit the pieces to be fitted, and wooden wedges are driven in to hold them firmly in place. To retrieve a hammer, auger, wrench, or other similar implement, the ends of the springs are separated, and a nail or stick is placed between them. The contrivance is then lowered into the well by means of a rope, attached to a wire bail at the opposite end of the pipe, and alternately raised a few inches from the bottom and dropped again. When the springs come astride the object sought, the latter dislodges the stick or nail, and the springs grasp the object itself, holding it firmly so that it can be brought to the surface.—L. M. Jordan, Wallace, Ala.



Notches Take Place of Cigar Cutting

Try cutting two notches near the end of a cigar, instead of cutting off the tip. The smoke will be drawn around the side of the tongue, and the teeth, fitting in the notches, will hold the cigar firmly in the mouth.

Timesaving Elevator Sign

In a building where there are two elevators, only one of which is required at certain times to carry the traffic, signs have been installed on the elevator-shaft doors, which enable the operator very quickly to notify persons on all floors which elevator is running. The sign placed on each door consists of two parts, the lower one being attached solidly to the door, while the upper swings on hinges, as illustrated. When the upper half is swung up, the sign reads "Please take the other elevator;" when it is swung down, the sign is entirely hidden. A spring holds this upper half in either position. When one of the elevators is to be stopped, the operator has only to step out at each floor, and swing up the upper half of the sign.

¶An ordinary cork, of sufficient size, should be attached to the boat key by means of a cord. The idea is that, should the key be accidentally dropped into the water, it would not sink to the bottom and become lost.

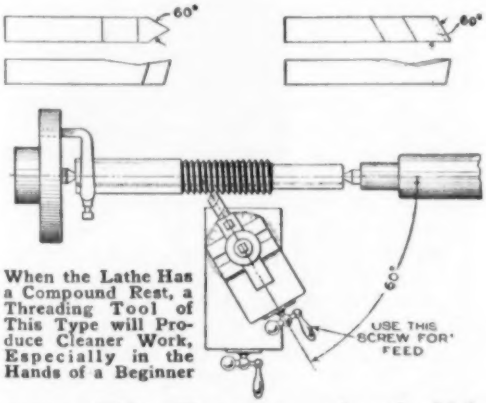
Cold-Weather Auto Starting

Less effort will be required to crank an automobile motor on a cold day if a filled hot-water bottle is placed on the carburetor, and allowed to remain for a few minutes. During this time the hood should be covered with a blanket. In case a tight clutch makes the cranking operation difficult, one of the rear wheels should be jacked up, a block placed before the front wheels, and the gears meshed for direct drive. It is then easy to crank the engine. When the motor starts, the gears should be shifted to neutral, and the brakes applied to stop the back wheel, before the jack and block are removed.—H. E. Lloyd Owen, Port Arthur, Can.

Improved Thread Tool for Lathe

An improved threading tool is shown together with the common type, in the diagram, the former being that at the right. The old kind cuts on both sides of the 60° angle, while the new one cuts only on one side of the angle. The compound rest is swung around to 60°, as shown. In this way the thread is cut as a regular turning operation, the metal being peeled off on the cutting side only, and not torn off on both sides. This difference results from the impossibility of giving any side rake to the common type of tool, while the improved tool may be given the proper side rake, producing the correct-shaped cutting edge.

When using the improved tool, advance into the work by the compound-rest

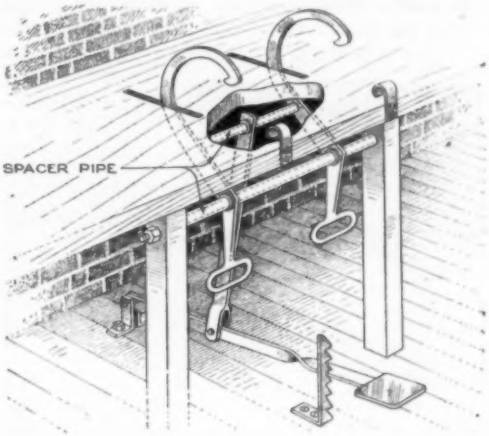


When the Lathe Has a Compound Rest, a Threading Tool of This Type will Produce Cleaner Work, Especially in the Hands of a Beginner

screw. This will produce a thread which will be found smooth and free from customary tear marks.—S. B. Royal, Philadelphia, Pa.

Old Ice Tongs for Tire Work

An old pair of ice tongs can be used to make a handy bench tire spreader for a garage. The tongs are taken apart, and their points dulled, so that no injury will



A Tire Spreader, Made from a Pair of Old Ice Tongs, Is a Very Useful Device When Installed on a Garage Bench

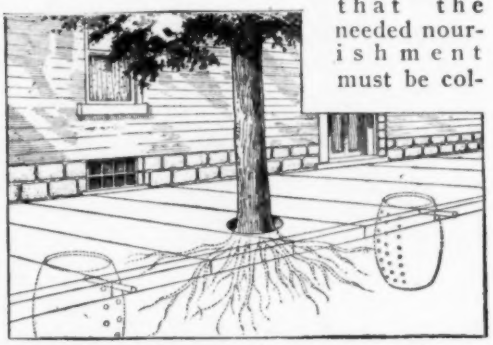
be done to a casing, after which they are pivoted 10 in. apart, on a ½-in. iron rod, as shown in the drawing. Lengths of pipe on the rod hold the parts in position. Another rod is used to join the parts. The first rod is fastened to two uprights under the bench, and the second is connected with a pedal, made of strap iron. The tongs pass through two slots in the top of the bench. Small pieces of strap iron, bent into hooks, are fastened to the edge of the bench as indicated. A notched piece of strap iron, bolted to the floor, holds the pedal in different positions. One edge of a casing is gripped by the strap-iron hooks, and the other by the ends of the tongs. When the pedal is pushed down, the tire is spread open, so that it can be repaired.—Dale R. Van Horn, Lincoln, Neb.

Floors Built to Keep Out Cold

When laying flooring on the first story of houses which are not to be heated by a furnace, it is of great advantage to cover the subfloor with building paper, strip with lath over the joists, and then lay the finish floor over the lath. This leaves a "dead-air" space between the floors, which will not conduct the cold through to the rooms like double floors laid together.—E. Ritchison, Modale, Iowa.

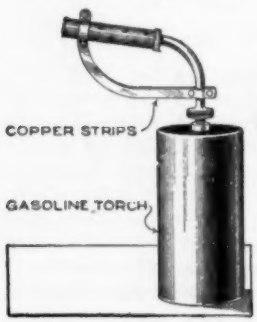
Underground Water Reservoir Aids Growth of Trees

Trees growing along the sidewalks of city streets are likely to wither unless special precautions are taken to supply the roots with moisture. A concrete pavement prevents the necessary quantity of surface drainage from reaching them, so that the needed nourishment must be collected by artificial means. Dig a pit in the sidewalk on each side of the tree, sufficiently far from the trunk to leave room for the roots. A distance of 10 or 15 ft. will be about right, as the roots extend underground for a considerable distance. Bore a number of 1-in. holes through the staves of two old paint barrels, and bury one of them in each pit, with the open end down, and the upper end just below the level of the pavement. Connect each barrel by a pipe with the gutter, and provide it with some sort of strainer to keep the dirt out while letting water run into the barrels. These will then act as a cisterns, and the water accumulated in them will percolate through the holes in the staves and nourish the roots of the tree.—T. B. Lambert, Chicago, Ill.



Barrels, 20 to 30 Feet Apart, are Buried beneath the Concrete Sidewalk to Act as Cisterns and Provide Artificial Irrigation

Improving Flame of Small Torch



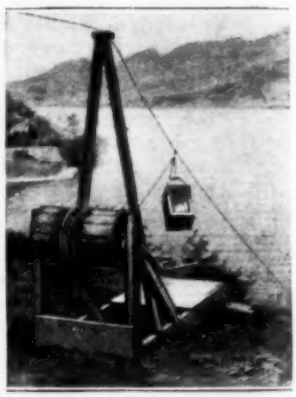
Small gasoline torches that produce red, sputtering flames will give better service if the burner and supply pipe are connected by heat-conducting strips. The torch will then burn with a very hot blue flame.

Automobile Painting Easily and Rapidly Done

Automobile owners who contemplate refinishing their machines should give consideration to the method used in painting army motor cars and trucks. These vehicles are painted at frequent intervals, but nevertheless are kept in constant service. This is made possible by the use of a paint, which is made by mixing white lead and coloring pigment with linseed oil, and adding a relatively large quantity of drier. It requires about an hour to apply a coat of this paint to an ordinary car, which is less than the time required for waxing and polishing—a temporary remedy. The paint dries in eight or ten hours, so if the car is painted at night, it can be driven the following morning. Before the actual painting is done, the car is carefully washed with soap and water, and rough spots are smoothed with steel wool. As no varnish is used, dust does not spoil the appearance of the coat, and the work can be done in any garage.

Drawing Water from Lake Far Below

A farmer whose home is situated on high ground adjacent to a small lake raises water from the latter for his stock and household use by means of a simple home-made device which cost little to construct. A ½-in. wire cable is stretched between a standard erected on an elevation, near the lake, and a heavy anchor about 15 ft. from shore. On this is a traveling block, equipped with a hauling line. The latter is attached to a rough wooden drum located at the base of the standard. Suspended from the block is a 4-gal. tin can, so weighted that it tilts and fills when it reaches the surface of the water. When filled, the can is pulled up the slanting cable by rotating the drum with a crank provided for that purpose. Its contents are then emptied into a bucket or other container, for carrying to the house.



Electrolytic Rectifier for Charging Storage Batteries

By THOS. W. BENSON

THE automobilist or experimenter will find the rectifier to be described cheap to construct and quite efficient. It is of the single-cell type, but by using three electrodes and a special lamp bank it utilizes both sides of the cycle. This construction is much cheaper than the use of an auto transformer, and but little less efficient.

The lamp bank and switches are mounted on a board, 1 ft. wide and 2 ft. long. Eight lamp sockets are mounted in two rows, with two double-pole switches at the bottom. These should be 10-ampere indicating snap switches, wired as shown in the diagram. The terminals for connecting to the storage cell to be charged are located at the lower edge of the board. The board is mounted on the wall convenient to a source of alternating current, a shelf to hold the rectifier cell being placed above it.

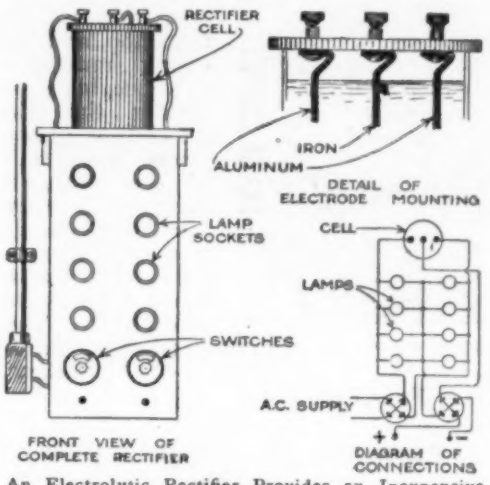
For the cell container, any large glass, or porcelain, jar will serve. The jar from a 300-amp.-hr. Edison-Lalande primary battery is ideal, the cover forming an excellent support for the electrodes. If one of these cells is not available, any jar 7 in. in diameter and 12 in. high may be used. Make a cover of wood, and impregnate it with paraffin. Three holes are drilled in the cover, to support the plates.

The plates measure 3 in. wide, 11 in. long, and 1/16 in. thick, two being of aluminum, the other of iron. Holes are drilled in the ends of the plates before bending, and then they can be mounted in the wood cover by bolts that form terminals. Connections are to be made to these terminals by flexible leads.

The solution put in the jar is made up in the following manner: To every 2 qt. of water add two tablespoonfuls of carbonate of soda and three tablespoonfuls of alum. Stir well and dissolve thoroughly before inserting the plates.

The apparatus is then ready for use. Screw eight 32-cp. carbon lamps into the sockets, and turn the left-hand snap switch. The lamps should light up to half brilliancy. The storage battery to be charged is connected to charging terminals by flexible leads, taking care that the positive post on the board is connected to the positive terminal of the battery. Turning the right-hand switch will start the battery charging.

This outfit is quite practical and serviceable. The maximum direct current obtainable is four amperes; this can be exceeded for short runs by using more lamps, but the jar will heat badly and will boil if the overload is continued too long. The outfit as described should give four amperes continuously without overheating. A number of storage batteries may be charged in series, and for high efficiency this is the preferable method of operating the device.



An Electrolytic Rectifier Provides an Inexpensive Means of Charging Batteries

Grindstone Frame Made from Part of an Old Bicycle

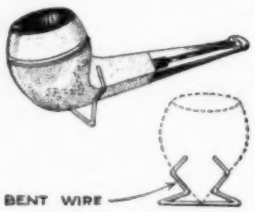
By using part of a discarded bicycle, a Georgia farmer fashioned the convenient foot-power grindstone shown in the accompanying illustration. The rear section of the frame was mounted on a wooden standard, and the circular stone substituted for the rear wheel of the machine. The value of the idea will be quickly seen by anyone who has attempted to use an ordinary hand-power grindstone without the help of an assistant. The arrangement supplies a ball-bearing device which is very easily operated.—Searle Hendee, Winnipeg, Can.

Oil-Well Casing as Air Tank

At a western oil company's shops, an oil-well casing, closed by welding at both top and bottom, serves as a compressed-air tank. The air is maintained at very great pressure in this shop, and the casing makes a safe receptacle for storing the air. Besides, being placed in a corner of the shop, it does not take up valuable room. It is supported on a wooden base about 1 ft. above the floor. The idea may be interesting to many small shops in the oil districts.—C. W. Geiger, San Francisco, Calif.

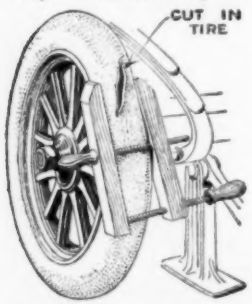
Stand Attached to Tobacco Pipe

A device that will prevent a tobacco pipe from tipping over is made by bending a piece of wire to fit on the stem and extend under the bowl.



Repairing Auto Tire on Rim

Cuts and holes in tires can be repaired very satisfactorily with cement and tire putty. It is quite a job, however, to get the cut cleaned out so the cement will stick, especially when the tire is on the rim; but it can be done very easily if the tire is deflated and an ordinary wood screw clamp is placed on the tire, as shown. By tightening the screw, the cut will be spread out, and can then be easily cleaned with a stick and a rag soaked with gasoline. Apply cement and putty before removing the clamp. This makes an extra good repair. —Chas. Albert, Chicago, Ill.



Testing Tool Steel at the Forge

Good steel may be easily distinguished from poor-grade stock by the following simple means. Heat the steel to a good cherry red, then hammer the surface well at the forge with a flat-faced hammer, as though the piece were being drawn out. It is again returned to the fire and heated to a cherry red, then plunged into water to quench it. The piece is struck with a hammer to make the scales come off. The surface left after this treatment is the index to the quality of the steel.

If the entire piece scales off clean, leaving a white surface, the steel is of the best grade and about 100 points carbon; that is, one per cent.

If the scales come off in patches, leaving a speckled surface, and the scales partly attached to the metal are very thin, the steel is of a good grade and about 75 to 80 points carbon.

If the scales come off in patches and the remaining scales are thick and heavy, the steel is a medium-grade of 40 to 50 points carbon.

If the piece does not scale off at all, it is very poor grade and low in carbon.

If the fire in which the work is heated is smoky, the degree of whiteness under the scales will be less pronounced, but the scaling process will be no different.

By these simple tests, the mistake of making a good tool from a piece of poor steel is avoided, as a piece of low grade sometimes gets in the rack with the good-grade steel. It is only necessary to test a small end. This may be done by cutting off a piece, or by leaving it on the bar, which will save the waste of any material.

To Renovate Typewriter Ribbons

Typewriter ribbons that have become dry, causing the letter impressions to be faint, can be restored to good condition by putting a few drops of any light machine oil on their edges as they are wound. After the oil has permeated all parts of the fabric, which requires only a little time, the writing will be improved.

Paraffin Repairs Leak in Float

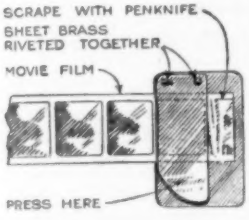
To repair small leaks in a hollow-metal float, the device should be placed in melted paraffin, and rotated until the surface is completely covered with the wax. This treatment fills the holes, and serves also to protect the float from corrosion.

Signs Made of Gummed Paper

Price signs for retail stores can be made by combining ordinary wrapping paper and gummed paper tape such as used instead of string to tie parcels. Suitable lengths of the tape are stuck on a piece of wrapping paper to form letters. If differently colored strips of tape are used, the attractiveness of the signs is increased.

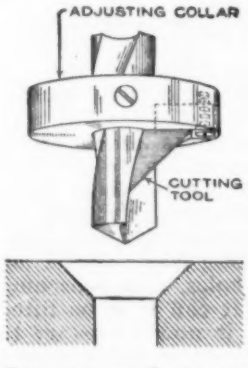
Protection for Film While Scraping

Motion-picture machine operators who splice many films will find constant use for a device which protects the film while it is being scraped to remove the emulsion. Although the emulsion must be removed before the two surfaces can be cemented together, great care must be taken to avoid scratching the next picture. A 2 by 4-in. piece of sheet brass, riveted at one end to a 3 by 4-in. piece, provides the necessary protection. The film to be scraped is slipped between the two pieces with the edge of the picture nearest the break held just under the edge of the smaller brass piece. The projecting portion of the film is easily scraped with a knife, while the whole film is kept from slipping by pressing down on the upper piece of brass.



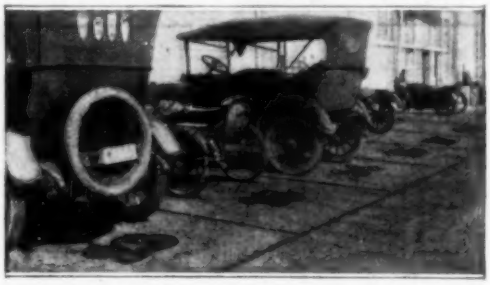
Adjustable Countersink on Drill

The tool illustrated drills a countersink in one operation. It is adjustable so that any depth of hole can be drilled. The attachment fitted to an ordinary twist drill consists of a collar containing a set-screw and a plate made of hardened and ground tool steel. The plate, or cutting tool, fits into a flute of the drill, and is attached to the collar with a screw. Separate tools are required for each size drill.—W. R. Calver, Brooklyn, N. Y.



Numbered Parking Spaces for Autos

The method of numbering motor-parking spaces illustrated by the accompanying photograph has been found highly advantageous at a western naval base.



By Numbering the Parking Spaces about a Naval Reservation, the Various Motor Vehicles are Easily Found

The idea might well be employed about large industrial plants, or other places where numerous motor vehicles are in use.

Thus, the officer who instructs an enlisted man to report to headquarters with a certain machine has only to say that it is in parking space No. 15, for instance, and the man knows exactly which machine is meant. With the usual system it is necessary to designate machines by make, description, and even license numbers, which causes considerable waste of time.

Funnel Spout for Oilcan

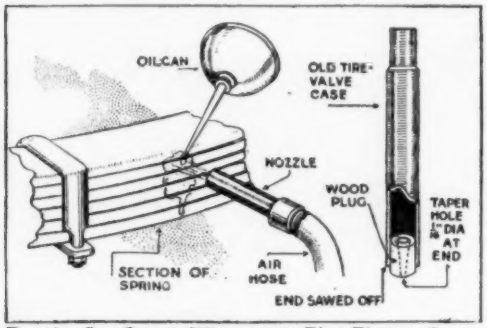
The spout-equipped oilcan illustrated is made by soldering together a 1-gal. tin sirup can and an ordinary funnel. The latter is cut diagonally across the flare, and a hole is cut in the top of the can to fit it. The funnel is then soldered to the top.

Spraying Removes Old Wall Paper

Old wall paper should always be removed in order to insure a smooth surface for the new paper. To do this easily, fill any common hand sprayer with clean water, preferably quite warm, and spray the walls and ceiling thoroughly. In a few minutes the paper will soften and can be quickly removed with the aid of a large knife, or spatula.—Milton P. Matthews, Chagrin Falls, Ohio.

Compressed Air for Oiling Automobile Springs

Many people try to avoid the disagreeable job of greasing auto springs, by applying a light oil to the side of the



For the Car Owner Who cannot Find Time to Grease the Springs in the Reliable Way, Compressed Air Offers Interesting Possibilities

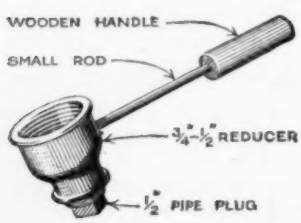
spring, trusting to its tendency to "creep" in between the leaves. Some of it usually does, but not enough to do much good. Of course the body of the car is first jacked up, so as to let the weight of wheels and axles open the spring as far as possible.

If compressed air is available, or even a helper to work the tire pump, a blast of air directed against the side of the spring will usually carry a part of the oil in where it belongs. The sketch illustrates the method. A nozzle may be improvised from an old tire valve, as shown at the right.

A little fine-flaked or powdered graphite mixed with the oil will make its effect much more lasting.—John A. Prior, New Haven, Conn.

Ladle for Soldering Wire Joints

Electricians will find the ladle illustrated a convenience for soldering wire joints on ceilings, where the use of a torch is inadvisable. The bowl is made from a pipe reducer, into the smaller end of which is screwed a plug. The rod is threaded and screwed into a tapped hole in the side of the reducer. A wooden handle completes the device. Cold solder is prevented from falling out of the ladle by the threads inside the reducer.—R. B. Miller, San Francisco, Calif.

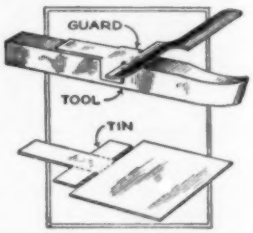


Cigar Ash Used as Silver Polish

Cigar ashes are excellent for polishing silver and nickelplated ware. Use a soft, slightly moistened cloth, or chamois skin, and dip it in the ashes; then rub the ware with a circular motion, finishing with dry chamois skin. Cut glass, china, mirrors, watch dials, and electric-light bulbs, too, will acquire a high gloss with such polish.—Al. Schaal, Red Cloud, Neb.

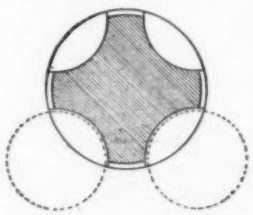
Chip Guard for Brass Turning

A guard, to protect the eyes from flying chips when brass is turned on a lathe, is made from a small piece of tin. The tool-post screw holds the device in place on the tool.



Removing a Broken Tap

When a tap breaks off inside a hole, especially if the metal being tapped is iron or steel, it is quite a job to get the broken piece out of the hole. Often the most practical method is to soften the piece with a blowtorch in order to drill it out, but this method is by no means reliable.



Where it is possible to use the part with a larger screw than had been intended, a good method of extracting the tap fragment is shown in the diagram.

Drill two smaller holes as indicated by the dotted lines, so as to fit into the flutes of the tap. After these holes are made, it is comparatively easy to knock the fragment around far enough so that half of the cutting edges of the tap come into the two holes, thus loosening the piece entirely. It can then be lifted or dropped out. It is now necessary to run a larger-size drill down the hole and retap it, substituting a screw of appropriate size.

Amateur Mechanics
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

Coasting without a Hill

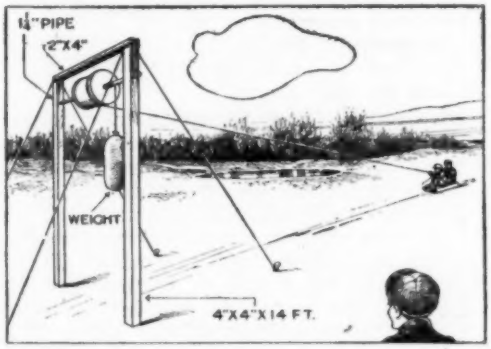
By DALE R. VAN HORN

TWO timbers for uprights, some scrap lumber, rope and a piece of pipe, and a smooth lot, make winter coasting possible where a hill, or other incline, is lacking.

For the framework, two uprights, 14 ft. long, are set 8 ft. apart and 3 ft. into the ground, with a piece across the top, for a brace. Ten inches below the top brace, two 1¼-in. holes are drilled to take the pipe shaft. Before the pipe is put in place, however, the drum and ropes should be arranged.

The drum is built up of two sets of wooden disks, cut from 1 or 2-in. material. One set is cut 8 in. and the other 12 in. in diameter. Each 8-in. disk is nailed in the exact center of the larger one, the grain of the two crossed to prevent splitting, and a hole is bored in the center to accommodate the shaft. The disks are attached to the pipe by means of ⅜-in. steel rods, which pass through holes drilled in the shaft and are fastened to the disks by staples or bolts.

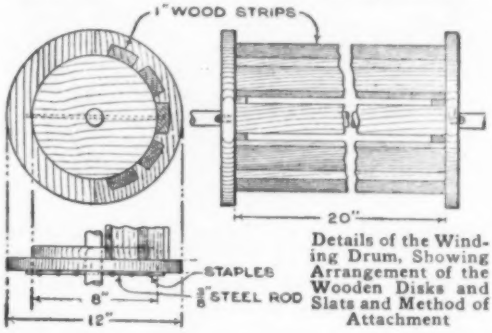
The inside disks provide the surface for nailing the strips, which complete the



A Weight-Operated Drum Overcomes the Lack of Hills and Gives Children All the Pleasures of Coasting and Healthful Exercise in the Open

drum. One-inch strips, 3 in. wide, are cut to length, spaced 1 in. apart, and nailed on. Holes should also be drilled at each end of the pipe to take small bolts or pins, to prevent its slipping out of the upright frame. Still another hole is drilled 20 in. from the end on one side, to take a small bolt, to which the rope supporting the weight is attached.

The illustration shows the device after it has been set up. A hundred feet of small rope should be obtained, one end of which is attached to the drum, the free



Details of the Winding Drum, Showing Arrangement of the Wooden Disks and Slats and Method of Attachment

end being held by the coaster. Twelve feet of ½-in. rope is required for supporting the weight, an end of this rope being fastened to the bolt already provided.

Now for the fun: Wind all the rope on the drum, leaving the weight, which may be an old bucket filled with stones, on the ground. When the small rope on the drum is unwound, it will wind up the other rope and raise the weight. Since very little pull is required to draw a loaded sled over hard-packed snow, a bag of sand may serve as well as a stone-filled bucket for the weight.

Then take the end of the small rope and walk away with it. When the rope has been unwound, the weight will be raised high in the air. Still grasping the rope, give the sled a shove and steer for the space between the uprights. As it passes underneath, let go of the rope and the sled will sail far beyond. A few trials will get the track well packed and the more one uses it, the farther one will go.

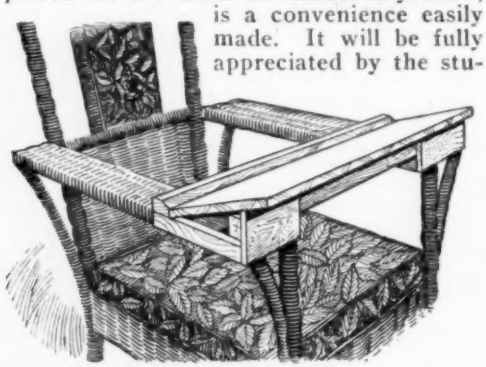
To prevent the rope from winding too

far on the drum and out of reach, tie a small weight to the end, which can be used as a handle. Guy wires should also be attached, as shown, to prevent swaying.

Even though there may be no snow on the ground, a track may be made by covering the ground with water until a coating of ice is built up.

Chair With Built-In Desk for Writing or Study

A small detachable desk, which can be placed on the arms of almost any chair, is a convenience easily made. It will be fully appreciated by the student or letter writer. The illustration shows how the desk is assembled. The crosspiece in front is 1-in. square, and the boxes that fit on the chair arms are made from ½-in. boards. A board, 7 in. wide, is used for the slanting top. The back crosspiece is shaped to form a trough at the lower edge of the top, to hold books and papers in place, and to prevent pens and pencils from rolling off. The wood should be stained and varnished to match the chair.—Leo Rosasco, Indianapolis, Ind.



Students and Writers will Find This Detachable-Desk Chair a Great Convenience

Light Aids in Trimming Prints

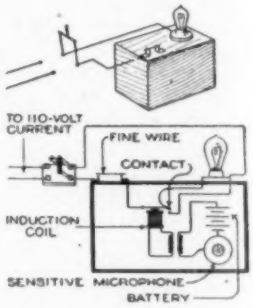
To get evenly cut margins when trimming photographic prints, arrange a light in such a manner that it will illuminate the print from underneath. This is accomplished by placing a light or a reflector below the trimming board. Then, when the print is placed a certain distance over the edge of the board, the extending part of the print will be distinguished by the light showing through it, and it will thus be possible to cut even margins on all prints.—Frederick C. Davis, St. Joseph, Mo.

Paint Mends Leaks in Pail

Small leaks in the bottom of a galvanized-iron pail can be mended by a very simple method. The outside of the bottom is given a heavy coat of paint. Before this is dry, a piece of strong cotton cloth, cut to fit inside the rim, is placed on the paint-covered surface, and all wrinkles are pressed out. The next day a coat of paint is applied to the exposed surface of the cloth, care being taken to cover all parts. The edges should not be neglected. The pail should not be used until the paint has dried thoroughly, which requires several days.—S. H. Keenan, Los Angeles, Calif.

Marksmanship by Magic

In this trick the performer brings forth a box on which is a stand for a piece of wire and an ordinary electric lamp. When this is connected up to the regular 110-volt current, the lamp lights. The performer loads a pistol, takes it about 20 ft. away from the box; aims, fires, and the lamp goes out. Upon examination of the fine piece of wire (No. 36 gauge), it is found severed in two parts. "Fine shooting"—but it is done with a blank cartridge!



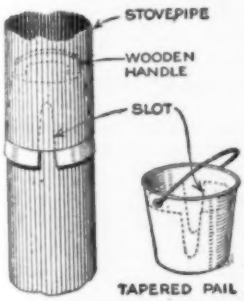
In the upper part of the illustration is shown the box and apparatus as the audience sees it. Below is the internal diagram. The circuit does not go directly from the fine wire to the lamp, though a fake connection can readily be mounted on top of the box. Actually the current goes through the relay below. The performer loads the pistol with a blank cartridge and fires; the noise caused by the discharge sends a slight current through the relay. This is caused by the sensitive microphone and battery. An induction coil in the circuit may help the action of the relay. The relay magnet pulls its armature away from one contact, and the armature touches the other contact. This is wired, as shown, so that the bulb is short-circuited, and all the current goes through the piece of fine wire, instantly melting it by the heat produced. Thus both the desired effects are caused: the immedi-

ate going out of the light, and the breaking of the wire.

The fact that the trick is so mystifying is due to the apparently simple nature of the apparatus. This effect may be heightened still more by making the box from a solid piece of fairly heavy timber, hollowed out to contain the microphone and the coil.—Philip A. Wall, Bedford, Massachusetts.

Stovepipe Joiner

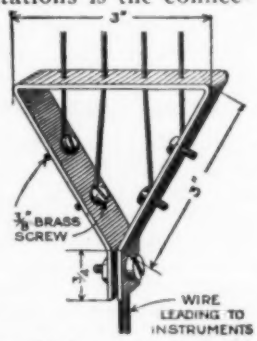
To connect lengths of stovepipe easily and quickly, take an old lard pail, which is tapered in form. Remove the ears and bail, cut a slit on the side, as shown, and fasten a wooden handle to the smaller end.



To use, the larger end of the pail is placed over the end of the inner pipe length, and the outer pipe is slipped over the pail, as shown. When the pipes are in the proper position, a slight pull on the handle removes the pail and leaves the sections connected.—Riley Edwards, Cincinnati, Ohio.

Aerial Connector Block

The weakest point in many amateur wireless-telegraph stations is the connection between the aerial wires and the wire leading to the instruments. If the connector block shown in the drawing is installed, loose joints will be avoided, and solder will be unnecessary. The device is made from a strip of brass or copper, 10½ in. long, ⅜ in. wide, and ⅛ in. thick, which is bent into a triangle. Wires pass through holes in one side of the triangle, and are fastened to the other two sides with brass screws. The ends of the strip are held together with a small screw bolt, and the instrument wire is clamped between them.—Lawton Shee, Oak Park, Ill.



A Hingeless Tool Box

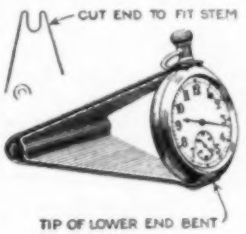
Although no hinges are used to attach the lid of the tool box illustrated, it can be locked as securely as if these fittings were employed. The lid is made in two sections, one of which is attached permanently to the box, with nails or screws. Two cleats are fastened on the other section, with their ends projecting over one edge, as shown. When the box is to be closed, the ends are thrust under the fixed section, and the removable section is dropped into position. Almost any type of lock can be used on the box, but a padlock, with hasp and staple, probably is the most suitable.—George H. Holden, Chesterfield, England.

Snap Fasteners as Electrical Connectors

In electrical work, it is often necessary to make a connection that can be broken easily, but replaced quickly. An ordinary snap fastener, commonly used on women's garments, is convenient in such a case. The ends of the wires are soldered to the two members of the fastener. To make a connection, the parts are snapped together; to break the circuit, they are simply pulled apart.—George E. Perkins, South Bound Brook, N. J.

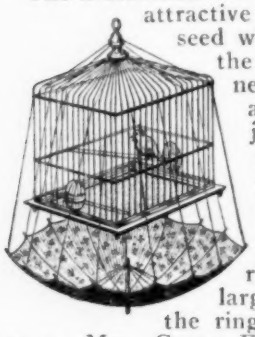
Watch Holder from Strap Hinge

An ordinary strap hinge can easily be converted into a device for holding a watch in a nearly vertical position on a table, or other piece of furniture. One end of the hinge is cut off to provide a straight edge, and in this is made a U-shaped slot for receiving the stem of the watch. The tip of the other end is bent to hold the bottom of the timepiece. This contrivance has the advantage of being collapsible and relatively light in weight, and when folded may be carried in the pocket.



Umbrella Catches Bird Seed

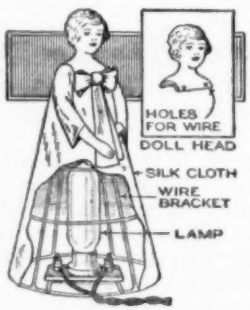
The illustration shows a convenient and attractive way of catching seed which may fall from the bird cage. Underneath it is suspended a Japanese umbrella, just large enough to extend beyond the edges of the cage. The handle is cut off short; threads are tied to all the ribs, and to a ring large enough to fit over the ring at the top of the cage.—Mrs. Grace E. Willey, Concord, New Hampshire.



Doll Lamp for the Bedroom

The head, shoulders, and arms from a broken china doll served nicely for making an attractive night lamp.

A wire frame was made, as shown in the illustration, and a miniature lamp socket was secured by fastening a crosspiece to the bottom ring. Wires were then attached and the binding posts made fast to the terminals of a length of flexible lamp cord, provided with a plug for attachment to the wall socket.



Holes were carefully drilled through the broken edges of the doll, as shown, and secured to the upright wires by bending them over.

The lamp frame is concealed underneath the doll's silk dress. When the current is turned on, the light gives a pleasing glow, and the head and arms show up translucent.—Dale R. Van Horn, Lincoln, Neb.

Replacing Broken Window Panes

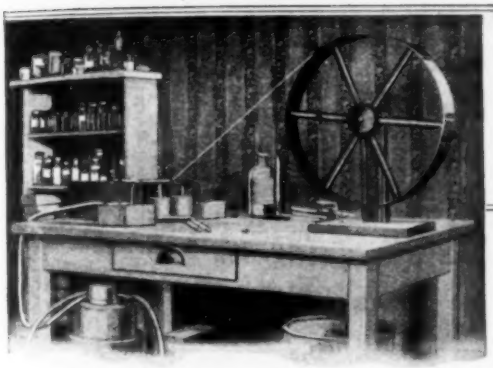
Not a great deal of skill is required to replace broken window panes with new ones. After the old glass has been taken out, the inside of the sash is scraped with a knife, or chisel, to remove the putty that remains. The rabbet, or groove, is then carefully measured. Glass should be cut 1/16 in. less in length and width than the rabbet, to allow for expansion. The amount of putty required can be estimated on the basis of 1 lb. for every 20 ft. of sash. Glaziers' points are inserted in the sash to hold the glass in place, being driven halfway into the wood, close to the glass, at 3-in. intervals. The putty is made into long rolls, about 3/8 in. in diameter, by rolling it between the hands. Starting at one corner of the sash, the roll is laid in the rabbet, whereupon it is smoothed and forced into the groove with a putty knife. In sash larger than 12 by 16 in., double-strength glass should be used.—W. S. Standiford, Youngstown, Ohio.

To Mend Broken China

Broken china dishes can be mended without the use of glue, or cement, by a very simple process, provided the fragments are not too small. The pieces are tied firmly together with a strong cord, and placed in a vessel containing skimmed milk, which should completely cover the article. The milk is allowed to simmer on a stove for 24 hours; then the vessel is removed from the fire, and left standing for the same length of time. The dish is now taken out of the milk, and allowed to dry thoroughly before the cord is cut. The drying process requires from five to six hours. A dish mended in this way can be scalded, and is strong enough to survive as rough handling as a new dish. This process converts the casein in the milk into a gluelike substance that is not likely to harbor germs.—Kate H. Brower, Parshall, N. D.

String Stops Alarm-Clock Signal

Most folks need only a few short rings of the alarm to arouse them in the morning. Any alarm clock may be fixed easily, and at no expense, to shut off the alarm after a short ring. A piece of light, strong twine is tied to the alarm winder, and several turns are taken around the shank of the key and brought over to the shut-off lever. When the alarm is wound at night, there is sufficient slack in the string to allow the lever to be set in the "alarm" position. At the time set for the alarm to go off, the alarm key will wind up the slack of the string and draw the lever over to the "silent" position. The duration of the alarm may be regulated by adjusting the slackness of the string.—Frank M. Ladd, Springfield, Vt.



GLASS SPINNING AND WEAVING

By R. R. Henderson

SPUN glass and glass wool are now being used for a large variety of purposes, such as filtering chemicals, manufacture of abrasives, erasers, glass cloth, storage-battery separators, etc. For the amateur, the work presents great possibilities of enjoyment and usefulness.

A small specimen of fine-spun glass may readily be prepared as follows: Heat a small piece of glass rod, or tube, if a rod is not handy, over a gas flame as indicated in Fig. 1. When the spot over the flame has softened and become somewhat red, grasp one end of the rod firmly with one hand, and the other end with the other hand. With one sudden sweep of the arms, extend the hands as far apart as possible. This stretches the softened portion of the rod out into a fine hairlike thread. To one unfamiliar with spun glass, this hair will appear remarkably flexible and strong.

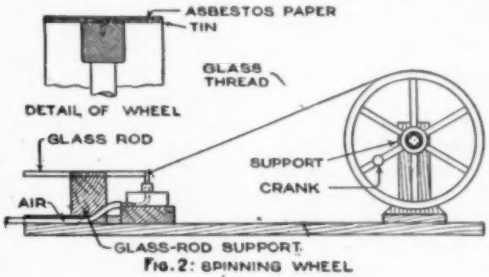


FIG. 2: SPINNING WHEEL

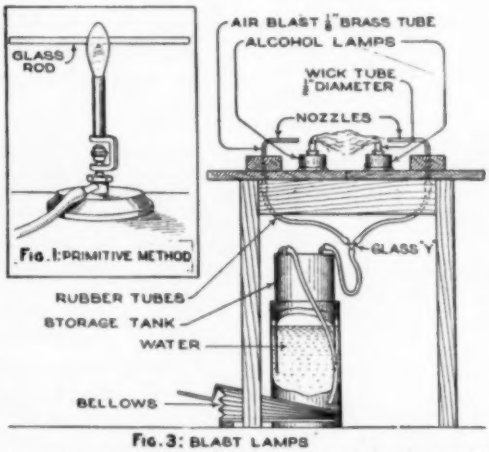


FIG. 3: BLAST LAMPS

Spinning the Glass: In Figs. 1 to 3 is Shown the Apparatus Required for Producing the Glass Threads

Blast Lamps

To prepare spun glass on a larger scale, it will be necessary to construct a blast lamp and spinning wheel. The type of blast lamp needed will depend upon whether city gas is available. If it is not, two alcohol lamps can be made. These lamps consist merely of two metal cans, as shown in Fig. 2, with a wick tube, which should be about ½ in. in diameter. This tube is filled loosely with several strands of cotton wicking, which should reach the bottom of the can and be trimmed off square at the top of the tube. The lamp is filled with denatured alcohol through this tube.

If city gas is available, the alcohol lamps may be replaced by an ordinary gas burner giving a flame about ½ in. in diameter. Whatever gas burner is used, all the air passages should be shut off.

Air Blast

The high temperature needed is obtained by using an air blast with the flame. The air-blast tubes are constructed from pieces of ⅛-in. copper tubing; the outlet ends should be reduced to a nozzle about 1/16 in. in diameter, by tapping lightly with a hammer. The tubes are supported on movable blocks of wood. This arrangement, combined with the flexibility of the copper tubes themselves, allows them to be adjusted in any direction to obtain the best flame. Rubber tubes are connected to the blast tubes, and to a tube with a pinch cock, which passes to the pressure regulator or storage tank. This tank consists of two cans, one slightly smaller than the other, and the smaller inverted in the larger, which is three-fourths filled with water. A weight is placed on the

top of the floating can, a smaller or larger one being used, according to the air pressure desired.

Air is pumped into this tank by bellows, or any other form of air pump. This causes the top can to rise in the water, holding the air below it under pressure.

Spinning Wheel

The spinning wheel, illustrated in Fig. 3, may have any diameter desired, but as it requires considerable skill to spin glass on the larger sizes, it will be more satisfactory for the beginner to use a wheel about 18 in. in diameter.

Any wheel, such as a discarded toy-wagon wheel, will do, and as the face should be about 3 in. wide, a strip of tin of this width may be tacked around the circumference. Since the contact of the hot glass threads with this cold tin might cause breakage, the tin should be coated with a layer of asbestos paper, which may be glued on with ordinary glue or rubber cement.

The wheel is then attached by its spindle to the upright support, and a crank is attached to one of the spokes.

Rod Support

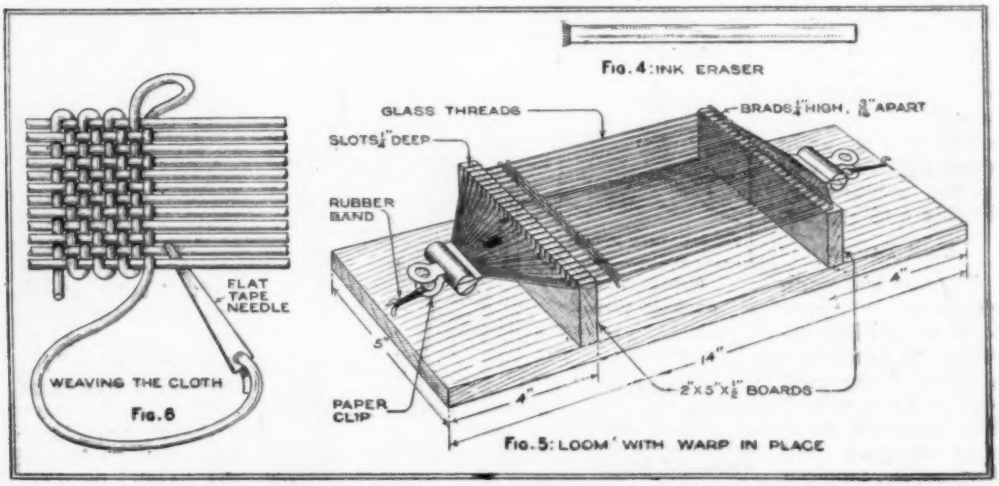
To support the glass rod while it is being softened in the flame, cut out a small block of wood, of proper height to bring it about ½ in. above the level of the burner outlets. In the top is then cut a groove in which the glass rod can rest. If a small piece of flat spring brass is tacked across the groove, the rod will be held firmly in place, and can be inserted or removed readily. It can also be fed into the flame by pushing the block forward.

Spinning the Glass

Insert a small piece of glass rod or tubing under the spring of the rod support. Light the gas or the alcohol lamps, and open the connection to the air-pressure tank; then adjust the air nozzles so that they will be close to the edge of the flames, and about ½ in. above the top of the burners. The air blast will then blow the flame in a horizontal direction, and there should be sufficient air to make the whole horizontal flame blue in color. If there is a tendency of the air blast to extinguish the flame, it indicates either that the pressure is too strong, or that the air nozzle is too low and should be raised a little higher above the burner tips.

When the proper air-blast adjustment is obtained, move the front blast lamp until the tip of its flame meets the point of the rear flame and mingles with it for about one inch of its length. At this meeting point a brushlike flame is formed, which is extremely hot, and it is here that the glass is melted.

Now the glass rod is placed in the flame, as in Fig. 1, except that in this case one end is fixed in a solid support. As soon as the glass softens and gets red, the wheel should be started revolving. Grasp the free end of the glass rod, and pull it suddenly out into a fine thread. With the same sweep of the arm, the thread is wrapped around the revolving wheel. Keep the wheel revolving by means of the



Figs. 4 to 6 Show Methods of Making Use of the Glass Thread: A Glass-Fiber Ink Eraser Is Novel but Effective, and a Simple Hand Loom Enables the Glass to be Woven into Sparkling, Silklike Fabrics

crank, and a continuous fine thread of glass will be produced. It requires a little skill and practice to make the glass reel onto the wheel, but after the winding is once started it may be continued for a considerable time. The tip of the glass rod should be advanced into the flame as the melted portion is used up by being drawn out into a thread. The more rapidly the wheel is revolved, the finer the thread. Care should be taken that the thread is reeled off as fast as the glass softens, otherwise it may get too hot and actually melt into drops, interrupting the thread and necessitating a new start.

After sufficient glass has been reeled onto the wheel, it may be removed by pressing the blade of a heavy knife against it, cutting completely through the layer of glass threads and allowing them to be removed.

Glass Wool

From this spun glass many articles may now be prepared. By revolving the wheel very rapidly and decreasing the heat of the blast lamp somewhat, very fine threads are spun. If these are then cut from the wheel and crushed together in a mass, a material resembling white cotton, or wool, is obtained. It is acidproof and fireproof, and is used in place of excelsior or sawdust for packing corrosive and inflammable liquids. It is also used for filtering acids and other chemicals, a small amount being pressed down in the bottom of a glass funnel, through which the liquid is poured.

Abrasives

By passing some of the glass wool through an ordinary coffee or other grinding apparatus, a fine glass powder is prepared which is used as an abrasive, similar to emery. For fine work, such as lapping or polishing, this glass powder should be sifted and only the very finest used. By coating pieces of cloth, paper, or leather with glue and sprinkling over it some of the glass powder, abrasive and polishing fabrics may be prepared.

Ink Erasers

A novel use for spun glass is the following: Take a bunch of spun threads, about 3 in. long and 3/16 in. in diameter, and, compressing them firmly, force the bundle into a paper tube, as shown in Fig. 4. This forms an excellent ink eraser, the sharp ends of the threads cutting away the ink rapidly without tearing the paper. This type of eraser is particularly liked by typewriter operators. As the glass wears away, a new portion may be exposed by cutting away the paper.

If the bunch of threads is slightly moistened with dilute sodium silicate (water glass) before compressing into the tube, they will stick together better when dry, giving a stiffer and more compact rod of glass threads.

Glass Cloth

There are many practical and ornamental uses to which a cloth made of glass threads may be put. It may be used for filtering acids and, being noncombustible, it can be used where there is some heat—though it will of course melt if the heat is great. If prepared from threads of several different colors, many beautiful articles may be made of it, such as lampshades, screens, or globes, which will not catch fire and are not easily broken.

One of the most ingenious uses of glass cloth is for storage-battery separators. In a storage battery the positive and negative plates must be separated by some material that is at the same time insulating, acidproof, and porous. It is evident that a cloth made of glass fulfills all of these conditions.

Hand Loom for Glass Weaving

Obtain a smooth piece of board, and screw to it two strips, as shown in Fig. 5. In the top of the strip at the right, drive a row of small brads, allowing about 1/4 in. of the brads to project from the wood. In the top of the other strip, saw a corresponding row of slots, forming a sort of comb. Screw in a small hook at each end of the board. Procure two strong flat spring clips, such as are used in offices for holding papers together, and two stiff rubber bands, about 2 in. long. Attach one end of the rubber bands to the spring clips, and the other to the hooks.

How to Weave

Take a bunch of spun glass from the spinning wheel, and cut it into 12-in. lengths. For a loosely woven cloth the full width of the loom, a bunch containing approximately 350 ends or threads will be required. Flatten out one end of this bunch of spun glass, and insert it in the spring clip. Next, separate the spun glass into small strands of about 12 threads each, and place between the brads. Taking the small strands one at a time, and twisting them slightly between the thumb and forefinger, insert them in the slots in

the other upright; this keeps them from untwisting.

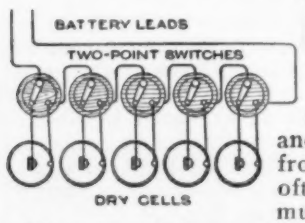
When all the strands have been twisted and placed in the proper slots, gather all the ends together and insert them in the other spring clip. The rubber bands connecting the spring clips with the hooks should be stiff enough to keep the glass strands tight. These strands form what weavers call the warp.

Thread a large, flat tape needle, such as shown in Fig. 6, with about 12 threads of spun glass, and insert it across the warp threads, passing over the top of one and underneath the next, alternately. Pull clear through, until the end of the glass strand gets close to the warp threads. This is known as the filling thread, or weft. Then bring it back again in such a manner that, on this trip, the weft thread will pass underneath all the warp threads above which it was passed on the first trip, and vice versa. This gives the plain weave effect shown in Fig. 6. Continue doing this until the desired length of cloth is done. When all the spun glass in the first needle is so nearly used up that there is not enough to pass completely through the warp again, pull the threads from the needle and allow the ragged end to stick out at the side; start with an entirely new length, as it is not advisable to try tying the two together. The ragged ends may be trimmed off after the cloth is completed. These filling threads should be kept as close together as possible, so after passing them through the warp, a sharp-pointed instrument of some kind—a pencil, for instance—should be used to push each succeeding one close to its neighbor. When the cloth is finished, it may be cut from the loom with a pair of scissors. To keep it from raveling at the ends, ½ in. of the warp threads may be left as a sort of fringe.

As the weaver becomes more expert in the use of the loom, and begins to use glass of various colors, new uses for the beautifully smooth and silky cloth will suggest themselves.

Easy Testing of Dry Cells

Many automobile owners who carry a battery of dry cells for ignition or for lighting, find that the chief objection to the use of these cells is that one of them is quite likely to develop a short circuit, due to becoming wet, or damaged in some other way. Many cheap cells even seem to deteriorate very rapidly without apparent cause, owing to some defect in manufacture.



To locate the offending cell and remove it from the circuit often requires so much working with nuts and connecting wires that the motorist is disgusted with dry cells altogether.

A way of simplifying this testing is shown in the diagram. A number of simple two-point switches are installed, there being as many switches as there are cells in the battery. A type of switch should be used which has a broad contact surface on the top of the contact points, as otherwise there may be too great a voltage dropped at these points. Connections are made as shown. When trouble develops and the current from the battery seems to be weak, each one of the switches may be thrown in succession, in order to test out the cells. This is easiest done by observing a lamp connected across the battery, such as a dash or tonneau lamp. If, when any switch is thrown to the right, the light grows dim, it may be concluded that the cell connected to that switch is supplying its share of the current. If the lamp shows no change, the cell is in poor condition, and if the lamp becomes more brilliant when the cell is cut out, then the cell is exhausted, and should be removed immediately.

By testing out each one of the cells in this way before starting on a trip, any bad cells may be located instantly, and replaced with good ones. It is well to attach the leads very tightly to the switches by means of nuts, and to fit spring connectors on the other end, so that any cell can be changed in a few seconds.

Safe Tie for Rope

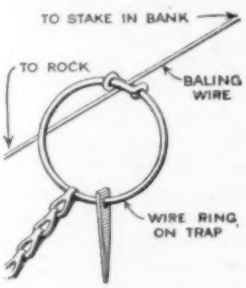
To make a non-choking neck halter for a horse or cow, an iron ring and a snap are tied to a length of rope, as shown in the drawing.—Forrest Benson, Boulder, Colorado.

Cutting Circular Disks from Paper

It often occurs that the amateur mechanic is called upon to cut paper into various-sized circular disks; this is easily done by attaching the paper to be cut to the board of a photographic print trimmer, with a pin or tack at the point which will be the center of the completed circle. By turning the paper lightly about this center and trimming off the edges that project beyond the cutter blade, a fairly accurate circle is produced.—Iwamo Inonye, Tokyo, Japan.

Trap Device for Drowning Game

One of the mishaps to which the trapper grows accustomed is the escape from a trap of a mink, muskrat, or other water animal, which leaves only its foot behind it. When the trap is set at the edge of a spring or lake, where there is deep water very close to the bank, the animal's escape can be prevented by the use of a length of baling wire, leading from a stake in the bank to a stone, or other heavy weight, resting on the bottom of the stream at a point where it is several feet deep. If the trap chain is provided with a ring of the type illustrated, the wire is slipped through in such a way that the ring slides along it, when moving downward, but catches instantly when an effort is made to pull it upward. To insert the wire, simply drive a 10-penny nail or punch between the ends as indicated. If a ring of other type is furnished with the trap, one like this can readily be made from some stiff wire.



It is common knowledge among trappers that when a water animal is caught in a trap, it dives into the water, carrying the trap with it, if the chain is long enough to permit this. When the ring, instead of being fastened directly to a stake in the ground, slides on the wire, the animal is able to dive some distance into the water, pulling the ring with it; but immediately on trying to reach the bank again, the ring catches, and the animal, being unable to reach the surface, is drowned.—Chester Cooper, Glenville, W. Va.

Card-Finding Trick

The home magician works at a handicap if he performs card tricks without proving that he has not had an opportunity of preparing the deck beforehand; and it is therefore a good plan to borrow one from the audience. He can then completely mystify it by identifying cards which have been drawn and replaced without letting him see the faces. The small wire device shown in the sketch enables him to do this. It is worn on his forefinger, which is curled up beneath the deck while the card is being drawn, and when it is pushed back into the deck, face downward, the wire point is pressed against the lower surface, scratching the face of the card. In this way he can easily identify the scratched card as the one chosen.—George N. Sleight, Saugatuck, Mich.

A Magician Scratches the Face of a Card When Only Its Back Is Visible, and is Thus Able to Identify It Afterward

Hacksaw Frame Uses Broken Blades

Broken hacksaw blades, in pieces 4 or 5 in. long, are usually thrown away, but if a frame is made of cold-rolled round steel, these short lengths will still serve a useful purpose in cutting off small screws, rods, or studs—work which often results in breaking the regular blades due to haste and carelessness. The frame is slit at the ends, which are sprung together to match the saw holes, and pins are inserted in the latter. The broken end of the blade must be heated before drilling. Two forms of handles are shown.—H. H. Parker, Oakland, Calif.

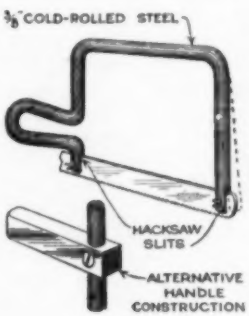
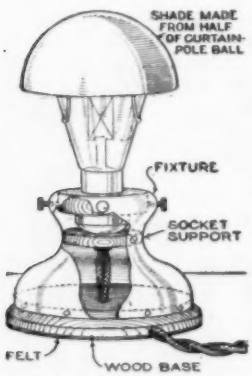


Table Leaves Used for Bookshelves

Festivity in present-day apartments is a rare thing—at least a function that requires the extension of the dining table to its full capacity. Closet room for the storage of the table leaves is also at a premium. As a solution of the problem, a bookcase was built, using the table leaves for shelves. When one or two of the leaves are required, the few books necessary to remove can be placed on top of the case. —Mrs. H. F. Summerhays, Chicago, Ill.

Desk Lamp Made from Scraps

A satisfactory desk lamp can be made from an old single-light ceiling fixture. A socket is supported in this by a wooden disk, as shown in the drawing, or by a metal bar, or disk, held in position by screws. Another wooden disk fits on the socket, and fills the space between the latter and the edge of the fixture. This disk is held in place by the thumbscrews with which the fixture is equipped. A wooden base is fitted to the large end of the fixture, and wires are passed through this and attached to the socket. Felt is glued to the base to prevent the wood from injuring the finish of furniture. A piece of rubber, cut from an old inner tube, will serve instead of the felt, if the latter is not available. The shade is made from half of a hollow brass ball, removed from the end of the curtain pole; the edges are turned under. Spring-brass wire, formed into two loops, is held inside the shade by a fancy-headed bolt, or by soldering underneath, which makes a neater job. The loops serve to hold the shade, which is adjustable, to the light bulb.—E. Nesbit, Quebec, Can.

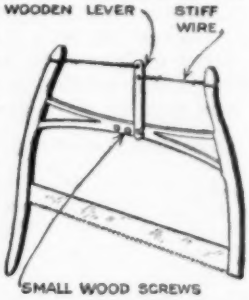


Telephone Protected from Lightning

To protect the coils of a telephone-bell ringer from the inductive effect of lightning in the neighborhood, two strips of brass, pointed at one end, are fastened to the binding posts, or terminals, of the coils, with the points about 1/16 in. apart. Instead of entering and damaging the coils, the induced current will jump across the gap between the points, which offers less resistance than the coils. The strips will not, of course, give protection from direct strokes of lightning.—Irl R. Hicks, Centralia, Mo.

Lever Tightener for Bucksaw

When it becomes impossible to adjust a bucksaw with the usual tightening rod, because of rust or worn threads on the latter, the wooden lever tightener illustrated can be used for that purpose. In some cases, the parts of the old rod can be utilized, by bending their ends into loops, which are passed through the holes in the lever. Otherwise, stiff wire is employed to fasten the lever to the frame. Small wood screws on the crossbar hold the lever in different positions, making it possible to vary the tension of the blade.



Roller Curtain for Drying Prints

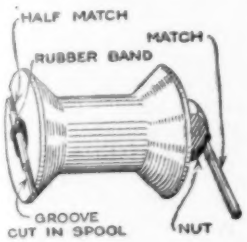
A useful device for drying photographic prints can be made by removing the painted cloth from a window-shade roller, and substituting for it a piece of white cotton cloth of the same size. A row of wet prints is placed near the end of the cloth which is attached to the roller, so that when the latter is turned, winding the cloth around the prints, the emulsion side of the prints will be convex. Another row of prints is then placed on the cloth, and the same operation performed again. This is continued until all of the cloth has been wound on the roller. The contrivance is placed in a warm place, preferably over a radiator, and allowed to remain until the prints are dry. Prints dried in this way will be nearly flat when removed from the roll of cloth.

Cold Hands Avoided in Outdoor Work

In doing many kinds of work outdoors in the winter, one's hands become extremely cold, as, for instance, in using nails. The discomfort may be entirely avoided by putting the nails to be used in a tin dish and placing them in the oven; when the nails are heated, take them outside for use. By heating the clothespins a little in the same way, a housewife can make the hanging out of clothes more agreeable in winter.—S. Leonard Bastin, Bournemouth, Eng.

Rolling Toy Made from Spool

An entertaining toy for the children that requires little time and no money to make is made from an empty spool. Half of a match on one end of a rubber band is placed in a groove on one end of the spool, to keep it from turning. The other end of the rubber band is passed through the spool hole, through the hole of a small nut, and over a whole match. By turning the latter, the rubber band is twisted and sufficient energy imparted to it to cause the spool to travel for a considerable distance when placed on a flat surface.—Glenn O. Wilson, Denver, Colo.



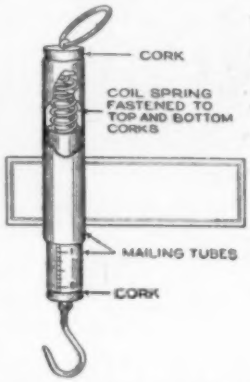
Emergency Push-Button Repair

When more suitable material is not obtainable, a small cork can be used to repair a push-button doorbell switch from which the button is missing. The cork is cut to the proper size with a sharp knife, and two pins are driven through it at right angles to each other, near one end. These serve to prevent the cork from being pushed out of position by the spring in the switch. In case the pins are too long to fit into the switch cover, they can be clipped off with a pair of scissors. A cork installed in this manner four months ago is still in service, and shows no signs of wear or decay.—K. McLean, Caledon, S. Africa.

¶If a hair which harmonizes in color with the material is used instead of thread for mending rents in garments, the repair will be practically invisible.

Postal Scale Made of Mailing Tubes

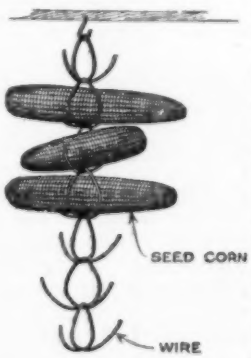
A neat and accurate scale for weighing small articles is made of two mailing tubes, one of which slips easily inside the other. One end of each tube is fitted with a cork, which is pierced with a short, stout wire, with eyes in each end and tightly pressed against the corks to prevent any play. The inside eyes of the two wires are joined with a spring of the proper tension and length, for light work, such as a bird-cage spring or a piece of spring from a shade roller.



The outside eye of the larger tube is fitted with a heavy wire ring for a support, and that of the smaller tube with a wire hook for attaching the articles to be weighed. When assembling the device, the corks are glued into the tubes and the inner tube is graduated by making marks on it at the edge of the outer one as various known weights are attached, and dividing the intervening spaces evenly. A coat of shellac adds materially to the appearance and durability of the completed scale.—Frank M. Rich, Paterson, N. J.

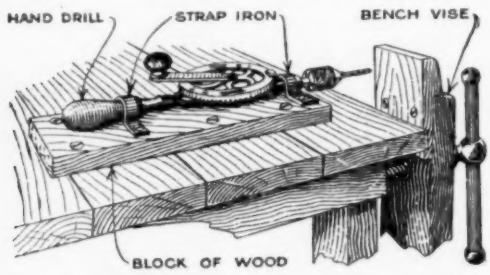
Wire Hanger for Seed Corn

The drawing shows a simple seed-corn hanger, made of old wire, that has some advantages other than its low cost. The wire loops, being assembled chain fashion, hold the ears of seed corn at right angles to each other, and as no two ears touch, perfect ventilation is assured. Each loop is adjustable, to accommodate ears of different size. The weight of such a hanger, when filled, is sufficient to hold the ears securely, since each ear is steadied by the weight below it.



Bench Vise and Hand Drill Form Drill Press

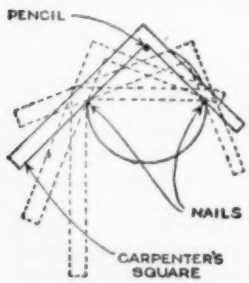
The arrangement illustrated will save a great deal of time where a large number



The Need of a Drill Press is Easily Supplied by Mounting the Drill Rigidly on the Bench and Applying Pressure with the Vise

of holes are to be drilled in thin material. The hand drill is attached to a block, screwed or nailed to the top of the bench, and in line with the upper end of the wooden vise. A support is made to fit over the moving part of the vise to hold the parts when they are drilled. The vise is closed until the drill bit touches the work to be drilled, and as the drill is turned, pressure is applied to the vise. After a little practice, holes can be drilled in the manner mentioned with surprising speed, accuracy, and neatness.

Laying Out a Circle with a Square



When no other means is at hand, it is possible to lay out a circle with a carpenter's square, driving two nails at the ends of a diameter, and marking as shown by the illustration.

Don't Be Afraid of Castings

Many amateur mechanics have a fixed idea that, if a machine or piece of apparatus requires castings, it is "too much of a job," and they give it up. While it is true that some castings are problems, in many cases they are easily obtained; the making of patterns is the "mean" part.

But simple patterns are not at all difficult to make. The mechanic should bear in mind that he must allow 1/16 in. per foot for shrinkage in iron and 1/8 in. in brass, in addition to whatever is needed for filing, machining, or otherwise finishing such surfaces as must be finished. The foundry will return a piece that is just the shape of the pattern and just the size, less shrinkage. In making patterns, remember that the pattern is set in the flasks with one half projecting downward and the other half upward, and there must be sufficient "draw" to allow the flasks to be removed after the sand has been filled in, without breaking the imprint made by the pattern. If, for instance, the pattern is a little bigger at the top than in the middle, it will "dovetail" into the sand, so to speak, and will not come out leaving a clean impression. If, however, the top is a little smaller, there will be sufficient "draw."

When a hole is desired in the casting, the patternmaker puts on "core prints." These are simply cylindrical pieces of wood, in the case of a round hole, of the size the hole is to be, and they are put on the pattern just as if they projected from the hole. Core prints are painted with black shellac to indicate what they are; the rest of the pattern is finished with orange shellac. The molder first makes an impression in the sand with the pattern, and when this is done, the core prints form recesses in which a core of hard-baked sand mixture is laid; the molder will use a core of the same size as the print. So there is nothing complicated about ordinary core work.

Patterns should be smooth and well finished, and free from uneven surfaces which would tend to break the impression in the sand. It is necessary to study a pattern job and figure out what position it will take in the sand so that it will come out clean. Avoid sharp angles; fill in corners with a fillet of wax or putty, if it cannot be formed in the wood itself, and round outside corners slightly. Avoid very thin sections.

The amateur mechanic who has always thought castings an insurmountable obstacle may learn a great deal by visiting a pattern shop and foundry and examining patterns to see how they are put in the sand. Watching the making of a few molds will throw so much light on the subject that it will be well worth while. Besides, it is an exceedingly interesting process. And there is a certain fascination in getting a casting from one's own patterns that is worth something in itself, to say nothing of the substantial work that can be done with good castings.

Martin Box for 20 Pairs Which is So Constructed That the Interior may be Readily Cleaned by Separating It from the Walls, as Shown in the Central Illustration

When the Birds Migrate in the Fall, the Hinged Perches beneath the Windows are Swung Up to Cover the Entrance Holes, So as to Keep Out the Sparrows

Some Artistic Bird Houses

PROVIDING suitable shelters and protection for his feathered friends is only one of the many pleasures and indirect benefits derived by the bird lover, particularly when he is able to make his own bird houses.

Some birds, such as the martins and swallows, are gregarious, and like to get together and be sociable, and sufficient accommodation must be provided to house a number of them in the same house. The upper illustration shows a martin box arranged to house twenty families, each compartment being 8 by 8 by 6 in., which makes very commodious nesting and breeding quarters. It will also be observed, in the center photograph, that the interior of the house has been constructed in such a manner that it can be separated from the walls and brought down, in order that it may be thoroughly cleaned out in the fall. When the birds have gone south, the perches, which are hinged to the walls, are raised and fastened over the entrances, as shown, in order to prevent the entrance of the pestiferous and ubiquitous sparrow.

A pleasing departure from the usual location of the bird house at the end of a pole, is shown in the lower illustration of a summerhouse built of small cedar logs. This arrangement of bird house and summerhouse is not only pleasing in appearance, but has a utilitarian value as well. The illustration in the center shows an elaborate and artistic martin house which is made of wood. The attractive stucco effect is obtained by mixing sawdust with white paint to the consistency of a creamy paste, and giving the structure a thick coat of it with a whisk broom. A heavier stucco

The Summerhouse and Bird House at the Left is Built of Small Cedars. A Stucco Effect of Paint and Sawdust Makes the Bird House Shown in the Center Particularly Attractive. The Photograph at the Right Shows a Simple Shelter and Feeding Platform Roofed with Thatch

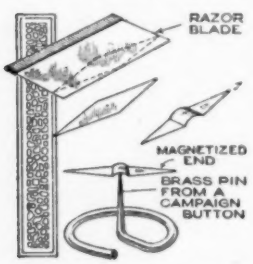
effect is given by adding another coat after the first has thoroughly dried. The roof is painted a light green, which enhances the beauty of this structure.

Bird shelters and feeding platforms are not particularly necessary in the summer time, but in the fall and winter they are indispensable, and many of the birds which we are accustomed to miss during the winter can be induced to brave the wintry winds if given assurance of protection and food. The simple bird shelter shown at the right in the lower illustration, is covered with a thatched roof of sufficient area to prevent the entrance of snow and sleet. For ease in cleaning, the feeding platform is made of tin, and is sufficiently deep to prevent the food from being scattered or blown away. Hooks for lumps of suet are attached to the pole supporting the roof.

Birds have no eight-hour law, and spend every minute of daylight throughout the summer in destroying harmful insects and seeds. It is remarkable that with very little in the way of care and protection, the birds will become very chummy with their human friends.

Compass That a Boy can Make

Any boy can make himself a good compass. Using a safety-razor blade as material, grind out, on an emery wheel or a hand stone, a piece shaped as in the sketch, to form the compass needle. Do not take the temper out while grinding; to avoid this, keep the blade wet. After the piece is formed, take the temper out of the center of the needle only, by a small gas or alcohol flame, and bend as indicated. Grind a point on a nail, and round the tip with emery cloth. Put the needle on a block of wood, and make a small dent in it with the nail. Obtain a brass pin from a campaign button or a piece of brass wire, and bend it as in the sketch, after putting a very fine point on it. Put the needle on the brass pin, the point in the dent, and grind the needle until it balances perfectly. Magnetize by rubbing the needle from the middle to one end with one pole of a horseshoe magnet, and from the middle to the other end with the other pole. When magnetized, the needle will turn north, and show a decided dip. Regrind the end that dips until it balances again. Polish all over, except for a small spot on the north side of the needle, to distinguish the two ends.



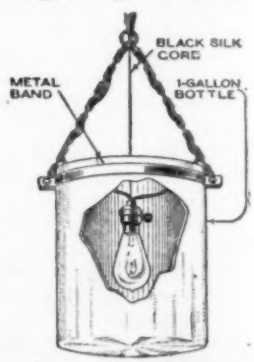
The hunter can make such a compass; using a straight brass pin, roll it in a bit of waxed paper and cloth, and drop it in the bottom of a pocket. When the day comes that he wishes for a compass, he will appreciate the fact that it can be made ready at a moment's notice.

Washtub Forms Home for Chicks

A shelter under which a brood hen can be confined, while her chicks enter and leave at will, is made from an old washtub. Every second stave is removed on one side of the tub, and it is turned upside down, so that the bottom serves as a roof. The openings made by the removal of the staves provide exits and entrances large enough for the passage of small chickens, but too small to accommodate any hen. — R. L. Ogden, Denver, Colorado.

Hall Lamp Made from Bottle

An attractive hall lamp, which can be made from a brown or green glass bottle, is shown in the sketch. After the top of the bottle has been cut off, a two-piece metal band is fastened around the remaining portion. Brass is the most suitable material for the band, though iron can be used, if given a coat of bronze paint. Chains of equal length are attached at the connections of the band, as indicated, and linked to a ring. A third chain is fastened to the ring, and serves to suspend the lamp from the ceiling. The light cords are laced in the chains. A silk cord, attached to the ring and the socket, holds the light bulb in place. To prevent light from being reflected on the ceiling, a pasteboard cover is placed on top of the bottle.—James E. Noble, Portsmouth, Can.

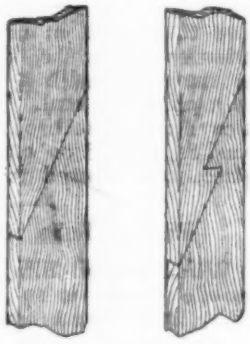


Earthenware Mended with Sealing Wax

If the handle of an earthenware water pitcher has been broken off accidentally, it can be replaced by using ordinary sealing wax as cement. Before the wax is applied to the surfaces to be joined, the vessel and the handle should be warmed in an oven, or on top of a stove. The parts are then held together tightly, until the wax becomes hard. Cloths are used to protect the hands during this operation. Surplus material is removed by scraping the union with a knife.—Frank W. Roth, Neosho, Mo.

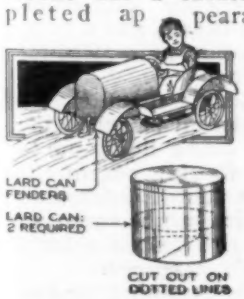
Strong Splice for Broken Stick

The common method of joining a broken stick is to make a straight cut at an angle, as shown at the left in the illustration. If the piece is to be under any tension, a far more satisfactory plan is indicated at the right. This joint is known as the bracing splice. It will be seen that there is a slanting cut at the end of each piece, with a step cut in each in both cases. These steps fit exactly into one another. The splice may be nailed and bound with wire, or glue may be used to make the wood adhere.



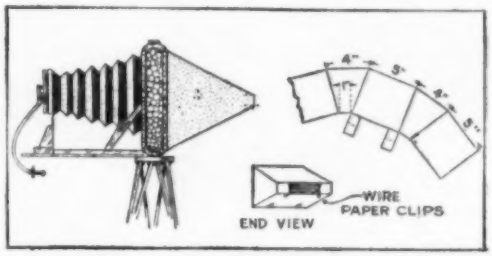
Mudguards for Toy Wagon

Generally the child's homemade automobile has a rather bare and uncompleted appearance unless mudguards are provided. The illustration shows how neat-appearing fenders may be made from large-size lard cans, which are obtainable from the butcher or grocer. With a pair of tin snips, the cans are cut off 6 in. from the bottom, and the shallow pan thus obtained, cut in half, provides two fenders.—K. P. Mikesell, Portland, Ore.



Focusing Hood for Cameras

Focusing a camera with a focusing cloth is often inconvenient. A hood cut from medium-weight cardboard is not so bothersome as a cloth, and when folded it is less troublesome to carry.



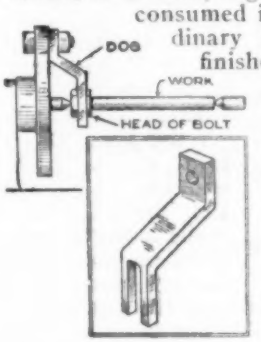
A Collapsible Pasteboard Hood, for Easy Focusing, is Held Together by Paper Clips, Which are Easily Removed for Carrying

The dimensions given are suitable for a 4 by 5-in., horizontal-loading camera. For a camera loading from the top instead of the side, or of a different size, the dimensions will have to be changed to suit. The cardboard is cut as in the pattern, the flaps being to cut out extra light, and the short piece at the left for binding.

The hood is assembled as shown, and is held together by paper clips. To focus, it is held up against the camera; when the hood is not in use, the clips may be taken off, and it may be folded up and put in the camera case.—Welton Grosdidier, San Francisco, Calif.

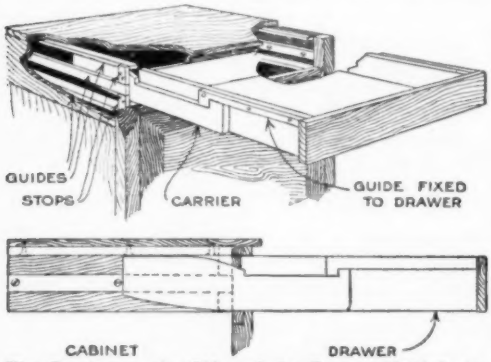
Lathe Dog for Turning Bolts

When a large number of bolts are turned in a lathe, a great deal of time is consumed in changing the ordinary lathe dog from a finished piece of work to a new one. In the illustration is shown a dog that makes this operation unnecessary. The device is made from a piece of ¼-in. stock, bent as indicated, and provided at one end with a slot, cut with a hacksaw to fit the bolt heads. At the opposite end a hole is bored. When the attachment is fastened to the faceplate, bolts can be placed in the lathe and removed without changing the position of the dog.



Simple Drawer Carrier

In the sketch is shown a drawer that is held level, even when drawn out its entire length. This is made possible by

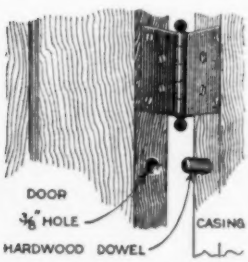


The Carriers at the Sides of the Drawer Hold It in a Level Position When It is Drawn Out to Its Full Length

carriers, one on each side of the drawer. These are guided by strips of wood, tacked inside the case, as indicated. Another guide is attached to each side of the drawer. Blocks of wood, nailed to the carriers, act as stops to prevent the drawer from being removed accidentally. If the drawer is lifted from the carriers, it can be taken from the case, and when the drawer is out, the carriers can be removed with a little manipulation.—E. R. Smith, Walla Walla, Wash.

Dowel Pins Prevent Opening of Door by Removing Hinges

To prevent locked doors from being opened by burglars, through the device of removing the pins from the hinges, proceed as follows:



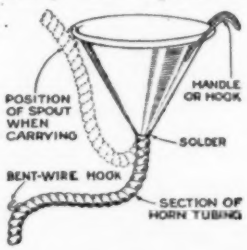
Close the door on the head of a lath nail, far enough so that the head will make a slight imprint on both the casing and the edge of the door midway between the hinges. With a 5/16-in. bit, bore a hole 1 in. deep at the nail-head mark in the casing, and set in it, with glue, a dowel, 2 in. long, of oak or other hard wood. Then bore a 3/8-in. hole 1 in. deep at the nail-head mark in the edge of the door. The hole in the door should be slightly larger than the dowel, so that the latter will not bind, and free entrance may be aided, if necessary, by tapering the point slightly. If only one size bit is available, both holes may be bored with it, and the projecting half of the dowel made a little smaller.—W. H. Wilcox, Los Angeles, Calif.

Preserving Broken Negatives

When a negative becomes cracked, the film may be stripped from its glass base and mounted on another plate. The film is first given a backing of enamel collodion. This is not absolutely necessary, but makes the film stronger and reduces the chance of damage in handling. After the collodion has dried thoroughly, the negative is placed in a solution composed of two drops of hydrofluoric acid (poison) to each ounce of water. Allow the negative to remain in this bath for several minutes, when the film may be loosened at the edges with a piece of wood, cut to a chisellike end. The film is then removed from the broken glass, thoroughly washed, floated onto a new plate of clean glass, and allowed to dry.

Funnel Tube for Engine Oil

When the oil-filling pipe of the automobile engine is so located that a specially bent spout funnel is required to put oil into the reservoir, the device indicated in the sketch will save the expense of special funnels. This flexible-spout filler was made up from a section of horn tubing, and, in consequence, is practically leak-proof. This is soldered to the funnel, and a bent-wire hook is likewise soldered in place for convenience in handling.



By means of this flexible spout, the oil can be carried from the oil barrel to the car, the flexible end being lifted up to prevent the oil from flowing out of the end. The size of the funnel determines the quantity of oil which can be conveyed at one time, and for this reason a large funnel is the most advantageous.

If desired, a hook for fastening the end of the tube to the edge of the funnel can be added, to further facilitate handling.—G. A. Luers, Washington, D. C.

Rubber-Band Noise Maker

To imitate the noise made by an airplane motor or a high-powered automobile engine, stretch a rubber band, about 5/8 in. wide and 11 in. long, between the handlebars of a bicycle, just in front of the grips. The machine is driven at a high rate of speed until the band begins to vibrate, after which it may be slowed up. The band will continue to vibrate, producing a buzzing sound, as long as the bicycle is in motion.—Philip Shera, Jr., Oxford, Ohio.

Picture Frame Made from Straw Hat

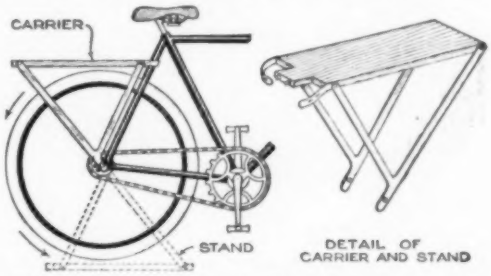
An old straw hat provides material for an unusual picture frame. The crown is removed, leaving an oval opening in the brim. A piece of glass, slightly larger than the opening, is placed on one side of the brim, and a picture is put behind the glass. If the top of the hat crown is large enough, it can be sewed to the brim, back of the glass and picture, to hold the two in place. Otherwise, a piece of pasteboard, cloth, or other material may be used for this purpose. The finished frame is colored with hat dye, and can be hung on the wall, or set in an easel.—Michael M. Mahalick, Bound Brook, N. J.

Light Fixture Holds Nail Brush for One-Armed Man

After my son lost one arm in the World War he experienced difficulty in washing his remaining hand. We experimented with various devices and finally had good results with a rubber electric-light fixture and a nail brush. The nail brush is firmly fastened in place of the electric bulb, and as the rubber fixture is the kind which adheres to a wall by suction, it can be adjusted in the same way to the inside of the washbasin. This device can be carried anywhere. The hand is easily cleaned by rubbing it up and down over the surface of the brush.—Katherine Louise Smith, Minneapolis, Minn.

Combining Bicycle Carrier and Stand

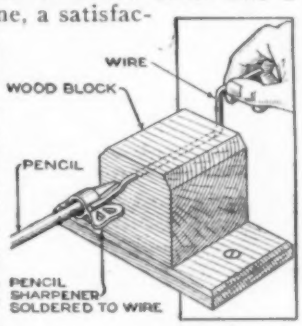
The useful contrivance shown in the drawing can be used either as a parcel carrier or as a stand, when attached to a bicycle. It consists of a board, pivoted on the rear axle in such a way that it can be placed under or over the rear wheel. In the former position, the device serves as a carrier, while in the latter it becomes a stand. Straps are used to secure the board when it is over the wheel.—Edward Huddlestone, Victoria, Can.



Bicycle Carrier and Stand: Parcels may be Tied on the Device, or It may Serve to Support the Machine

Crank-Operated Pencil Sharpener

At the expense of a few cents and a few minutes' time, a satisfactory and rapid-acting pencil sharpener may be made, by soldering an ordinary small sharpener to a piece of heavy wire, bent as shown in the illustration, and mounting the whole on a block of wood which may be fastened to a desk or table. A few turns of the crank will sharpen the pencil with satisfactory neatness, and with less effort than is usually required to sharpen it by other means.



Target-Shooting Rest

The amateur finds it very difficult to support some target rifles, and this difficulty is reflected in his inability to make good scores. A folding music stand, such as used by musicians, is deprived of its rack and fitted with a suitable semicircular rest for the gun. Such a rest is adjustable to various heights.—Wm. E. King, Monessen, Pa.

HANDSOME TROPHY FOR WRITER OF BEST BUSINESS LETTER

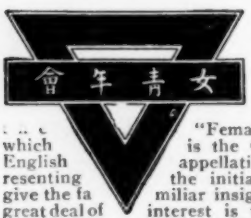
Nearly every business man prides himself on his ability to write a good letter. Those who have composed business letters of proven power now have opportunity to enter them in contest for a trophy of real merit. The prize, offered by the extension department of a Chicago college, is a bronze inkstand, on which the young figure of "Opportunity" offers to the master of writing the implements of the art. The bronze is the work of a noted sculptor, and is original, only one being cast. As the only test of a business letter is its result-getting power, the rules of the competition call for proof of returns, cost figures, and other essential details. The letters for the contest must be written during the year ending June 30, 1920.

THOUSAND-DOLLAR PRIZE CONTEST FOR BEST AIRPLANE PARACHUTE

Airplane parachutes, designed to promote the safety of aerial pilots and passengers, will have a chance to compete for prizes totaling $1,000 at Havana, Cuba, February 21 to March 1. Elements to be considered in the contest are the method of attachment to machine or airman; simplicity and certainty of operation in the seconds of time available in emergency; control of opening in relation to the fliers' safety belts; speed of drop and degree of oscillation in the air; weight; controllability while falling, and quick release upon landing. From the results of the competition it is hoped an aerial-safety device will be developed which will become standard equipment on air craft, as life preservers are on boats. The chairman of the contest committee may be addressed at Liga Aerea de Cuba, Manzana de Gomez, Havana.

STRANGE NAME GIVEN Y. W. C. A. IN CHINESE CITIES

Though the insigne of the Young Women's Christian Association remains the same in every land, the name of the organization is subject to change. In China, where 44 American secretaries are at work in 10 of the largest cities in the republic, the association is known as "Female Green Years Society," which is the Chinese equivalent of the English appellation. The characters representing the initial letters of these words give the familiar insigne an odd appearance. A great deal of interest is taken by Chinese women in the society, which has been growing steadily since its establishment in the oriental country about 15 years ago.



SCHOLARSHIPS FOR STUDENTS OF RAILROAD PROFESSION

Now railroading has entered the ranks of the learned professions. Provisions have been made by an enterprising transcontinental line to award 60 railroad scholarships a year to young men who wish to study the subject. Candidates will be recommended by business men of the communities along the route, and those accepted will be sent to a school in San Francisco and paid a nominal wage while pursuing their studies. The positions in the freight and passenger departments and general offices, for which graduates will qualify, are those that lead to executive opportunities.

NEW COLLEGE SONG MAY WIN FIFTY-DOLLAR PRIZE

Dissatisfied with the present supply of "snappy" songs appropriate to the character of Iowa State College, that institution's alumni association has established an annual prize of $50, to be awarded to the writer of the best song submitted each season. Competing songs will be judged in June, and the first year's contest is open now. Reserving the right to use desirable songs that do not win prizes, the association hopes in a few years to have a collection worthy of publication in book form.

WINNERS OF ARMY'S AIR RACE FINALLY GET MONEY PRIZES

The cash prizes donated by supporters of the army's recent transcontinental air derby have finally been awarded to those who finished the long grind. The excessive delay has been caused by the complications of the scoring system which involved comparison of elapsed time, actual flying time, and general efficiency, each of these items being deduced from the mass of data turned in by the commanders of the 20 control stations. Of the 62 pilots who started the race, but 13 shared in the awards, which totaled $6,150. To Lieut. B. W. Maynard, first to finish, and to Lieut. A. Pearson, Jr., winner by actual flying time, went $1,025 each; to a third officer was awarded $769; three others got $513 apiece; while to the last seven was given $256 each.

WESTERN SCHOOL GIVES SHORT COURSE IN PURIFICATION OF WATER

A course of instruction of extreme brevity, in a subject of unusual character but highly important, is announced by the University of Texas. The study will cover the chemical treatment of water for public supply, as taken from streams, lakes, and reservoirs. The course will be completed in 10 days' time, and is intended particularly for operators and employes of water plants and filtration projects. No charges will be made, as the plan is part of a campaign conducted by the state board of health. It is expected that the class will be formed in February.

PATENTS

By James A. Sanaker

I spend my leisure makin' things
That never seem to run;
My drawings and my reckonings
Don't pan out right when done.

And still I'm everlastingly
Beginning something new;
While hoping yet to see the day
When Fortune sails in view.

My tinkerings and putterings
May seem a foolish waste;
But nothing ever yet was done
In any kind of haste.

I'll keep it up, I guess, until
The day I pass away;
I know at least I've patented
A darn good way to play.

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